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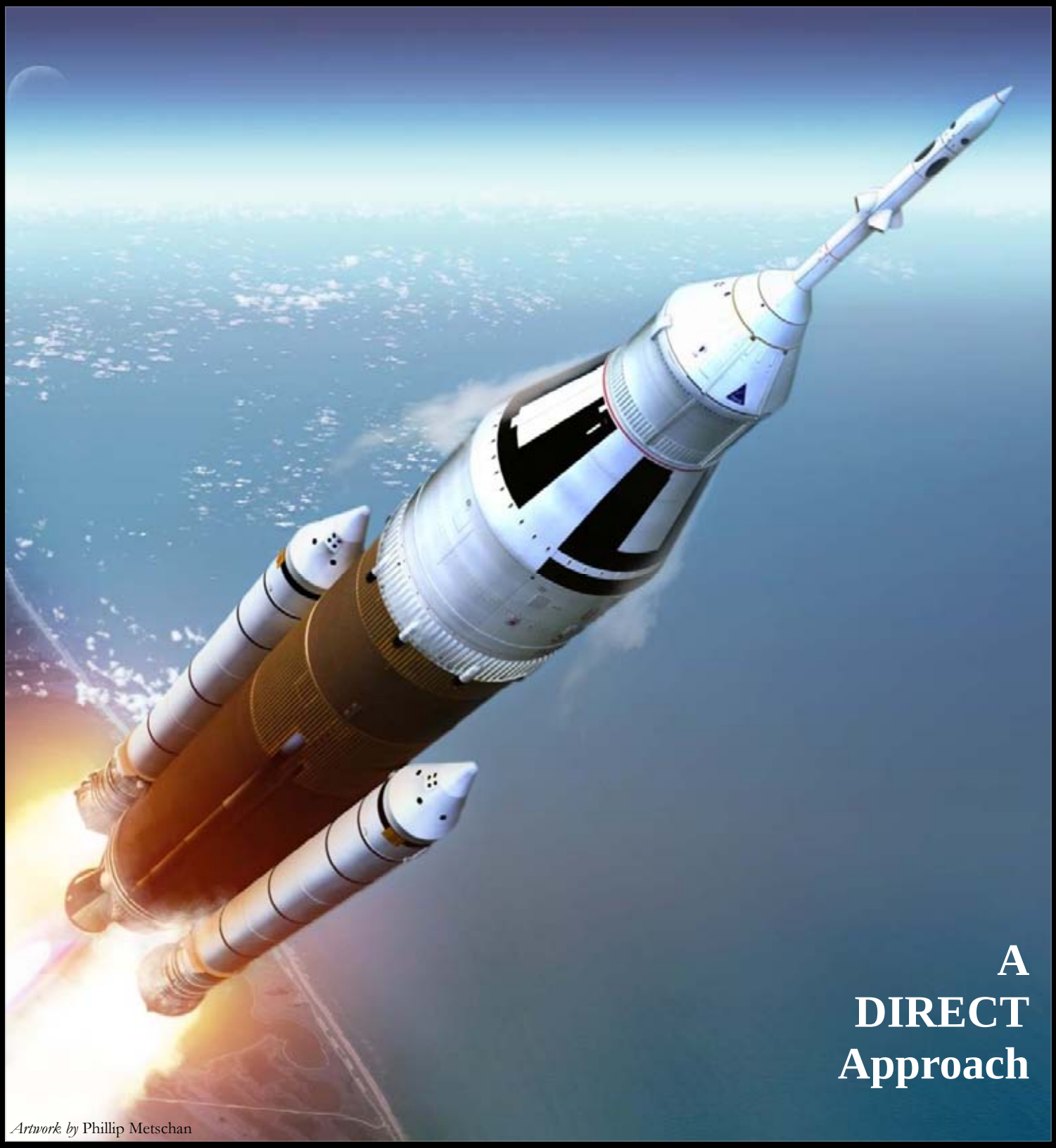

A DIRECT Approach

Artwork by Phillip Metschan

AIAA HOUSTON

American Institute of Aeronautics and Astronautics

Summer 2007

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Jon S. Berndt
Editor

T A B L E O F C O N T E N T S

Horizons and AIAA Houston Web Site AIAA National Communications Award Winner

2005 2006

Cover: The Jupiter vehicle proposed by the DIRECT Launcher team lifts off in this rendition by Phillip Metschan.

From the Editor

JON S. BERNDT

About a year and a half ago our January/February issue of Horizons featured an article about open source software for the scientific and technical audience. In my column for that issue, I asked the rhetorical question, "… could something similar to the OSS [Open Source Software] paradigm be applied to, say … a space program?"

It would seem that it *can* be.

Last October, the direct-launcher.com web site went live and presented the initial results of a collaborative effort that proposes an alternative to the Ares-1/V pair of launch vehicles:

"*A grass-roots effort, supported by many engineers and mid-level managers within the National Aeronautics and Space Administration (NASA), is announcing its proposal today, targeted to influence NASA to review again its plans for the new "Ares" family of launch vehicles. If adopted, the new approach promises to save the agency $35 Billion over the next 20 years.*

Called the "Direct Shuttle Derivative", or "DIRECT", the proposal calls for NASA to replace the separate "Ares-I" Crew Launch Vehicle (CLV) and the massive "Ares-V" Cargo Launch Vehicle (CaLV) currently being designed to replace the Space Shuttle, with a single "Universal Launcher" system capable of performing both roles." - Ross Tierney

An "Open Source" Launch Vehicle Family?

The initial proposal was found to have some weak spots, and an effort was made to refine the proposal. The result is the DIRECT v2.0 STS-derivative, "Jupiter" family of launch vehicles, announced on May 10, 2007:

"*Today the team behind the 2006 DIRECT proposal issues a newly revised study seeking to persuade NASA to re-examine the decision to use two completely different Ares launchers to support NASA's new mandate of returning humans to the moon and taking them to explore the rest of our solar system.*

At the end of last year, Dr. Doug Stanley, author of NASA's Exploration Systems Architecture Study (ESAS) Report provided a critique of the version 1 proposal. This revision is a direct result of that critique. All of his comments respecting the DIRECT launch vehicle were taken seriously, and the entire proposal was re-evaluated in that context." - Ross Tierney

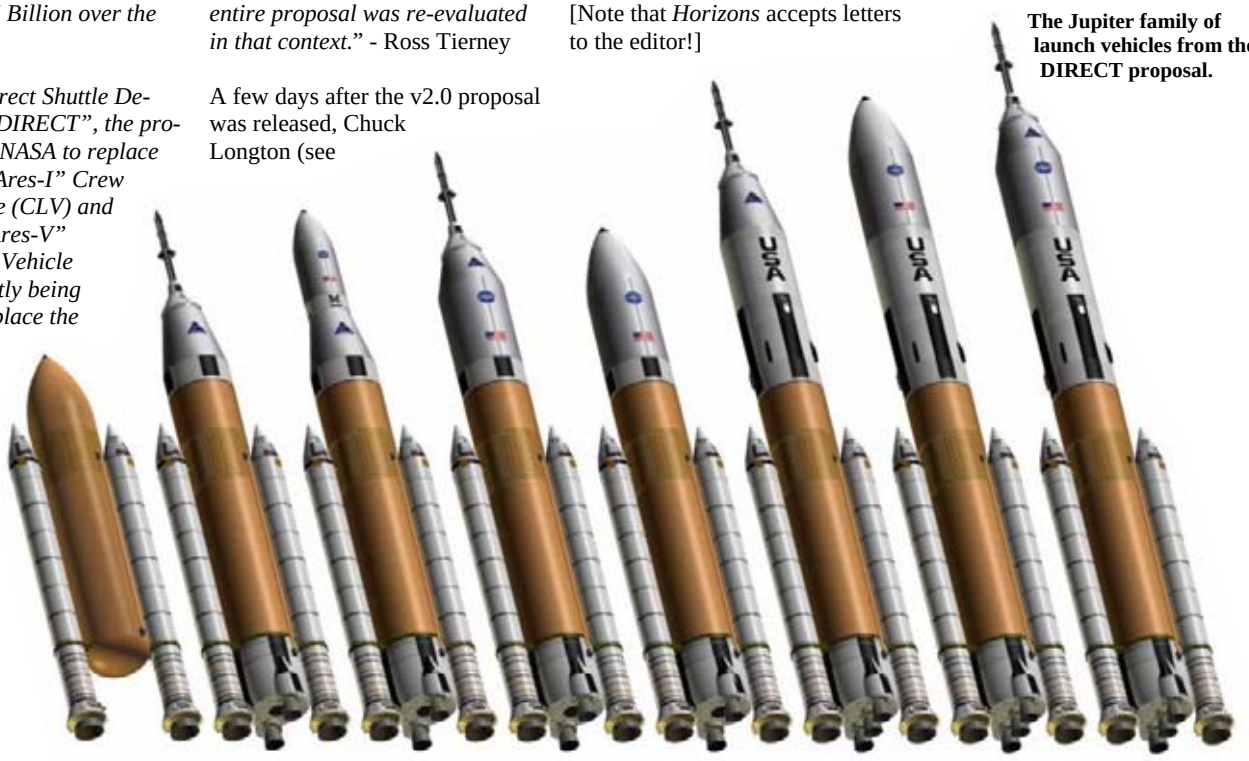
A few days after the v2.0 proposal was released, Chuck Longton (see his article in this issue) posted this note to the community of forum users at NASASpaceFlight.com:

"*Please take the proposal apart and put it back together again; see if you can find anything that is a showstopper. If you do, tell us. Put it out there for us all to discuss. We put this proposal together, but it isn't just ours. It's ALL of ours.*

We have put together what we believe is a very good proposal. But who knows? Only you do. Obviously, we are biased in our opinion, but we can be and are open to instruction and correction, as required."

At the very least, this exercise has generated a lot of discussion that has been instructive to readers of the DIRECT-dedicated forum thread. But it aims to be much more than that. On the surface—at least—the DIRECT proponents have presented what many view as a compelling argument.

[Note that *Horizons* accepts letters to the editor!]



The Jupiter family of launch vehicles from the DIRECT proposal.

Chair's Corner

DOUGLAS YAZELL, AIAA HOUSTON CHAIR

It's a golden age for Houston space programs with space shuttle, space station, and CEV-Orion in work at the same time. ISS is now big, symmetrical, and inspiring with those new solar panels. A few years ago part of my summer vacation reading was a nonfiction book I liked, Lost in Space, by Greg Klerkx. He recommended a new space age with two features, The first was going to space including the Moon, Mars, and beyond with robots and people, but primarily with people. The second was making space passengers of the average person in the same way it happened with powered aircraft passengers, starting with wealthy tourists. Since then, President Bush's Vision for Space Exploration speech seems to have hit the target which Mr. Klerkx recommended for NASA. Combined with Scaled Composites winning the X-Prize with White Knight and Spaceship One (and combined with other space entrepreneurs), I would say we are now in the new space age that was Mr. Klerkx's inspiration.

Attendees at the leadership retreat: phoning in: JJ Johnson. Front row: Nick Pantazis, Sheikh Ahsan, Brenda Weber, Ellen Gillespie, Chester Vaughan, and Sarah Shull. Back row: Jim Palmer, Chad Brinkley, Tim Propp, Mike Lammers, Jayant Ramakrishnan, and Sean Carter. Photo by Douglas Yazell.

We will be calling people in search of volunteers to join our work, since we have a few vacancies on our org chart. Almost all volunteers in our section get more from this work than they put into it. In our operations branch, we need a college and co-op chair, a public policy chair, a membership chair, and a professional development chair. Three or four of our ten councilor positions are vacant. And in our technical branch, we have no chair for our Space Science & Astronomy technical committee. One last vacancy: our International Space Activities Committee (ISAC) has four experienced members but no chair. I am currently leading the ISAC work to create a sister section relationship with the Toulouse Midi-Pyrenees branch of the Association Aeronautique et Astronautique de France (AAAF), where space tourism is a topic of great interest. Retired NASA/JSC engineer Jim McLane would like to see someone lead the Chinese sister section which he helped to create with ISAC in about 1987. Despite the lack of activity in recent years since about 1992, one Houston section member, Chris Taylor, had dinner with some of those Chinese sister section members from the Shanghai Astronautical Society while he was in China on an extended business trip, as reported in Horizons (November 2003).

Upcoming events for our July through June reporting period include the Annual Technical Symposium led by Sean Carter, the Student Paper Conference led by Sarah Shull, lunch-and-learns, dinners, young professional (under 35) events, and more. Other ideas include a radio-controlled model plane contest, a golf scramble with industry leaders, a career planning workshop and more. Looking ahead at the 50th anniversary of the launch of Sputnik on October 4, we have penciled in a lunch-and-learn on that subject by author and journalist James Oberg on October 3, 2007. Trying something new, we are putting the recorded video and audio from a recent dinner meeting speech on our section's web site. For now, our section's web page (on the opening page in the "Take a Closer Look" section) has a link to our dinner meeting speech video at www.nasaspaceflight.com, a web site whose creators are not associated with NASA. We also might put the first 10 minutes or less of this video on www.youTube.com to create publicity for our section's work. Video files there are limited to 10 minutes. The speaker from that dinner meeting is Elon Musk of SpaceX.

Last year we printed 1500 copies of a new poster celebrating 75 years of AIAA. The poster was created by our section member Dr. Rakesh Bhargava. Every AIAA member in our section is entitled to one of these posters, and we will deliver most of them by finding volunteers in each company or organization in the Clear Lake area.

Our section's annual leadership retreat took place Saturday, July 14, 2007, at Cimarron, Inc. in the Clear Lake area, just after our new Young Professionals Chair Jim Palmer attended the AIAA Regional Leadership conference in Cincinnati, Ohio, 12-13 July, 2007. Most of the attendees at the retreat are shown in the adjacent photograph. Please join us when you can in our volunteer work. You can contact us by phone at 281-244-3925, or use contact information on the web site at www.aiaa-houston.org, including chair@aiaa-houston.org. Executive council meetings are held on the first Monday of most months at the Northrup Grumman office in the Clear Lake area. Our section's new year is off to a good start in this golden age of space programs in Houston.

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A DIRECT Approach

CHUCK LONGTON, MEMBER AIAA

Feature Article

FIRST THINGS

In keeping with the educational spirit of Horizons, I was asked to present the Jupiter launch vehicle and the DIRECT architecture to the membership. I confess to being surprised when asked, knowing that a significant percentage of the readership is in some way involved in the Ares concept, which DIRECT was fundamentally conceived to replace. But I was assured that this portion of the readership, while totally dedicated to the successful execution of their responsibilities, would be interested in understanding where this launch vehicle proposal came from, what drove its genesis, what it is capable of and why the DIRECT team believes NASA should adopt it in lieu of Ares.

The DIRECT team has both a public and a private face. The public face is composed of five persons, Steve and Philip Metschan, Antonio Maia, Ross Tierney and myself. Behind us are approximately 50 design engineers, analysts and managers at various levels throughout NASA HQ and its field centers and at a variety of key NASA contractors. Also contributing to the effort are countless other professionals from around the country and in Europe and Australia who continually offer insights and observations from different perspectives, and quite a few "outside-the-box" suggestions. The full number of contributors will probably never be known, because they come literally from everywhere. What does matter is that once all the conceptualizing was completed and a coherent concept was finalized, the "team" was able to verify, using the same tools and procedures as NASA that the concept worked, and worked well.

This article will present only two of the many possible launch vehicle configurations that belong to the Jupiter family, the two that form the basis of the ESAS ISS Shuttle Replacement and Lunar Program for DIRECT. Many other configurations are possible, some of which are shown in the "Fleet" graphic on page 3 of this issue.

BACKGROUND

Theoretically, the Ares-I / Ares-V launch concept is a good idea. Too often missed in the conversations of pro and con for Ares-I is the Saturn-V class heavy lift vehicle for the Moon and Mars. Crewed missions to the Moon and Mars are mandated in the VSE, but bringing such an expensive new launch vehicle online in today's economic and political climate would prove to be extremely difficult at best. To his credit, the new administrator of NASA, Dr. Michael Griffin, together with other notables, was able to devise an architecture that enabled this lifter, while addressing the additional VSE requirements of a Shuttle replacement and continued servicing of the ISS. The solution was the pair of Ares launch vehicles, where a small launcher, constructed almost entirely of active and flight-proven hardware, is deployed to replace the crew transport functions of Shuttle and provide service to the ISS, and at the same time, to be the financial stalking horse for the flight articles needed for the heavy lift. The Ares-V would be too expensive to navigate Congressional authorization by itself, but if some of its development costs could be shared by a second, less expensive vehicle that addressed the immediate need to replace Shuttle and service the ISS, then the heavy lifter drops into the realm of the affordable. Thus was the Ares 1.5 launch concept born. It was a good idea.

This approach was truly Shuttle Derived, reusing to the maximum extent possible the existing flight articles from the STS, maintained both the viability of the launch and manufacturing infrastructure and — of most importance to the congressional masters — the employment levels in their respective districts and states (politics always matters). It was expensive, but affordable, and with a deployment schedule that was initially reasonable.

But the best laid plans of mice and men — and Administrators – well, we all know what happens to them. First was the announcement that Shuttle's SSME would not power the architecture, for various reasons. Replacing it was Pratt & Whitney/Rocketdyne's RS-68 engine, currently powering the Delta-IV launch vehicles and optimized for sea level operations, but upgraded for continual operation at the 106% power level. The lower total performance of this engine vs. the SSME drove other changes as well, including discarding Shuttle's 8.4m diameter ET in favor of a new, larger 10m tank for the heavy lifter. This changed the footprint of the Ares-V and drove massive reconstruction requirements of the launch infrastructure at the Kennedy Space Center (KSC) and manufacturing at the Michoud Assembly Facility (MAF). This new tank weighed more, as did the amount of propellant it took to fill it. Next, the J-2S+ engine was replaced with an even more powerful version, the J-2X, capable of providing 295,000 pounds of thrust.

The Ares-I was not unaffected by this, because it had lost the SSME upper stage engine. To maintain commonality with the Ares-V, the J-2X was substituted in its place. The performance of this engine however, was not up to the SSME performance, and coupled with Orion's weight growth issues, Ares-1 could no longer comfortably place Orion into orbit for lunar missions, where Orion would be at its heaviest. To counter this and, at the same time, to keep as much commonality with the Ares-

(Continued on page 6)

Chuck Longton is a Sr. Structural Design Specialist at General Dynamics Electric Boat Corp in Groton, Connecticut where he manages a design group responsible for creating the tools required to build the nation's nuclear submarine fleet. He has a total of 40 years in structural design, including Pratt & Whitney. Chuck is an AIAA member.

American Institute of Aeronautics and Astronautics

(Continued from page 5)

V as possible, the existing 4-segment SRB was replaced with the new, still undeveloped, 5-segment SRB that was planned for the Ares-V.

This completed the transition of the original Ares concept from a true Shuttle-Derived approach to the Shuttle-Heritage concept we know today. The current Ares launch vehicles, while resembling the STS hardware in appearance, now actually have very little in common with it. Both Ares-I and Ares-V, once built primarily of existing in-service flight articles and one heritage engine, was now constructed almost entirely of non-existent, new development hardware.

Conceptual artwork by Phillip Metschan.

In the case of the Ares-I, the 5-segment booster, while resembling the in-service 4-segment booster, is actually a completely different rocket. Even the propellant mixture is different, and the core grain has a different shape. This gives the thrust curve totally different characteristics with which STS has no experience. Adding the fifth segment lengthened the vehicle such that control authority became an issue, requiring extensive development beyond what had been originally baselined. The solution of weight increase, while needing addressing in the future Ares-V program, was now being forced onto the critical path for development of the Ares-I to support ISS missions. This, coupled with the higher altitude this SRB reaches as a main stage, has a huge effect on SRB recovery.

In the case of the Ares-V, changing the ET to a 10-meter diameter drove the overall footprint out by an additional 1.6 meters. The result of this is that the existing manufacturing, service and launch infrastructure from STS can no longer accommodate this launcher. The MLP (Mobile Launch Platform) and LUT (Launch Umbilical Tower) are no longer able to handle this much larger vehicle and need complete replacement. In the VAB (Vertical Assembly Building) likewise, everything changes, because it was originally sized for the 8.4m ET and none of the work platforms now fit. Everything needs to be replaced. At MAF where the tank is manufactured most of the tooling would now need to be replaced, and the ocean-going barge - which transports the ET - would likewise need replacement.

Going bigger on the ET changed absolutely everything. This single change snowballed to the point that the entire concept became essentially a “clean-sheet” design, which only resembled the existing STS, but which was, in fact, entirely different.

For a number of reasons related directly to this design change, the schedule of the first crewed launch of the Orion spacecraft has now slipped from mid 2011 to September 2015, and may slip further to April 2016. This condition will likely cause havoc in the workforce at most of NASA’s field centers following Shuttle’s retirement in 2010. One of the fundamental reasons the Congress bought into the initial Ares concept was, being fully Shuttle Derived, the workforce would be essentially unaffected, with the required reductions being absorbed mostly thru normal attrition. Under these new schedule conditions, NASA will be facing a devastating loss of skilled talent not unlike the period between Saturn and Shuttle. The majority of job loss will now likely be thru layoff rather than attrition. Uniquely knowledgeable professionals, once gone, are irreplaceably lost.

There is however, another condition that potentially could result from this. While admittedly speculative, historically the pattern is valid, has been repeated in the past and, if repeated again, would prove deadly for Constellation. The current members of Congress are for the most part, the same ones that accepted the Ares-I/V combination concept and provided funding to begin. Under that plan, most of them would still be in their elected seats when Ares-I became operational and Ares-V development began in earnest. This would guarantee, as much as anything could be, that the Ares-V would actually be built, because the Congress would feel a sense of obligation to finish what it had started. But because of all the redesign that has occurred with the Ares concept, the schedule has moved operational status of the Ares-I and development-start of Ares-V so far to the right that it is unlikely any of the original Congressional authorizers will still remain in their seats. They will have been replaced, in both houses, with new members who owe no allegiance to the VSE or the Ares design concept. The new operational dates are 3 full Congresses and 3 Presidential administrations away, and we will be in the midst of a 4th. All their interest by then will have narrowed to just getting Orion and Ares-I operational so that we can stop paying the Russians, in dollars and in embarrassment, for rides to the ISS. They will have been elected to office to focus on other items of concern, and the Moon will not be on the list. Ares-V will hold no interest for them, nor will the Moon. We’ll hear things like: “The VSE? That was when President Bush wanted to go to Mars after 9/11, wasn’t it? I think I remember my Dad talking about it.” The one great opportunity will have passed by, un-seized. The Moon and Mars will be lost to us - again.

This potential outcome is given even greater credibility by Mike Griffin’s recent acknowledgement at the Strategic Management Council of 22 May 2007, as reported by SpaceRef.com on July 1 of this year, that the Moon is no longer his

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focus. He is now focusing on replacing Shuttle's ISS servicing ability and that the decision to explore beyond Earth orbit after building the Orion Crew Exploration Vehicle will be determined by the next administration.

The bottom line is that I and others believe that because of this change, the Ares-V will never be built. We are going to end up with the Congress funding one, and only one launch vehicle. It's the only one we will be able to get for a very long time. Given that condition, if we really do want to go back to the Moon and on to Mars, then that one launch vehicle that Congress has pledged to pay for, needs to be capable of going to the Moon. Otherwise, we will be stuck in LEO for another 30 years because Congress is not going to build 2 launch vehicles. They will pay for just one, and Ares-I by itself can't get us beyond LEO. This is the concern driving the team that created DIRECT.

THE DIRECT ARCHITECTURE

The DIRECT Architecture departs from the ESAS recommended approach of two unique launch vehicles and replaces both with a single vehicle design that can be configured in several different ways to match the mission profile. The design philosophy is essentially that a single medium lift launch vehicle based entirely on existing Shuttle hardware and infrastructure and other in-service flight articles, should replace the Shuttle, rather than one small and one large launch vehicle. The DIRECT launch vehicle maintains complete commonality with the existing STS flight hardware, manufacturing and launch infrastructure, and will maximize workforce retention at NASA and all its Field Centers. The launch vehicle is designed to be configurable to support anything from the smallest mission profile of servicing the ISS and other LEO destinations to the larger mission profile of human missions to the Moon and Mars. Essentially, DIRECT creates a family of launchers, all sharing the same footprint as Shuttle, and reusing with minimum alteration, only existing flight hardware and infrastructure. The first member of the family consists entirely of existing flight articles in active service today. Additional members incorporate a new upper stage to be powered by the J-2XD engine, of Saturn heritage.

The basic concept is not new. NASA's Marshall Space Flight Center first proposed something similar in 1986 in the aftermath of the Space Shuttle Challenger disaster. It was promoted as one of the most logical alternatives for launching uncrewed cargo and even potentially a re-started Apollo spacecraft program if required. Congress told NASA that there were no funds available for building any new vehicles, so the idea was shelved and NASA concentrated on fixing the Space Shuttle program instead.

In 1991 the National Launch System brought the idea back to life. Together, NASA and the DoD proposed it as an alternative to the Titan IV. The design was based on the same SRB's as Shuttle, the same core tanking, but it had four smaller, inexpensive engines and considerably lower performance than the original concept (the RS-68 did not yet exist). Once again, NASA was informed that there were no funds available for building any new vehicles. Again, the idea had to wait.

Then in 2005, NASA's Exploration Systems Architecture Study (ESAS) included a very similar design to DIRECT. The standard Shuttle SRB's, with a Core Stage based on the existing ET size and capacity, but with three Space Shuttle Main Engines (SSME) mounted underneath and a payload shroud above. Known as LV-25 in its cargo configuration, its performance was not fully analyzed using an Ares-V-like EDS during ascent to increase payload performance. Independent analysis indicates LV-25 with an EDS could have achieved over 110

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Additional primary DIRECT team members:

Ross Tierney is a British citizen formally working in the IT field. In 2000 however, he started his own company, Launch Complex Models, creating highly complex and extremely detailed scale models for both the professional and the enthusiast space industry. He has offices in both the UK and the US. Ross has written journalistic pieces for NASASpaceflight.com, thru which he networked with over 50 NASA design engineers and managers and other team members resulting in the initial DIRECT concept. Ross originally conceived what became DIRECT and was the original public face for the proposal, which was published in October of 2006, after almost a year of work and analysis.

Philip Metschan is an Art Director for film and video, working out of San Francisco, California. He is presently employed at Pixar Animation Studios on the upcoming feature "Wall.E," due for release in June of 2008. Prior to Pixar, Philip was a Visual Effects Art Director at George Lucas' premier visual effects studio, Industrial Light + Magic. During his tenure at ILM his credits included; Star Wars Episode 2 and 3, Hulk, War of the Worlds, and Transformers, just to name a few. Independently, he produces artwork for aerospace, games, and documentary films from his private studio, Principia-Graphica, www.principiagraphica.com.

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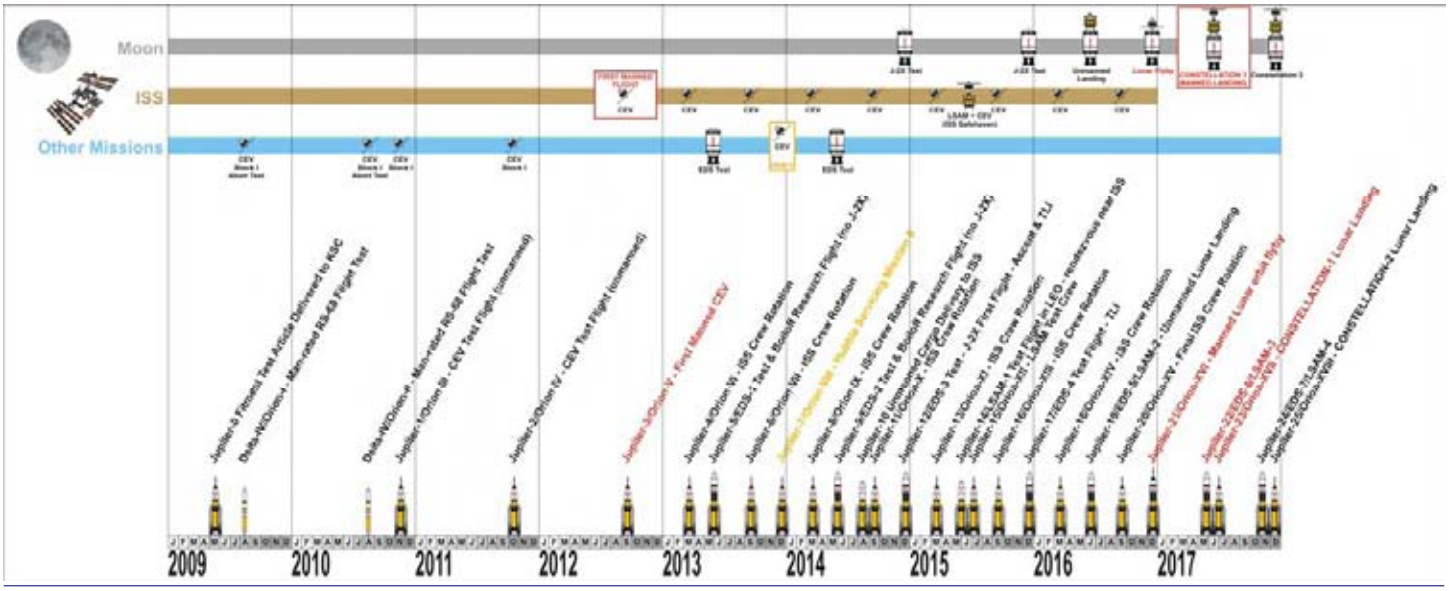
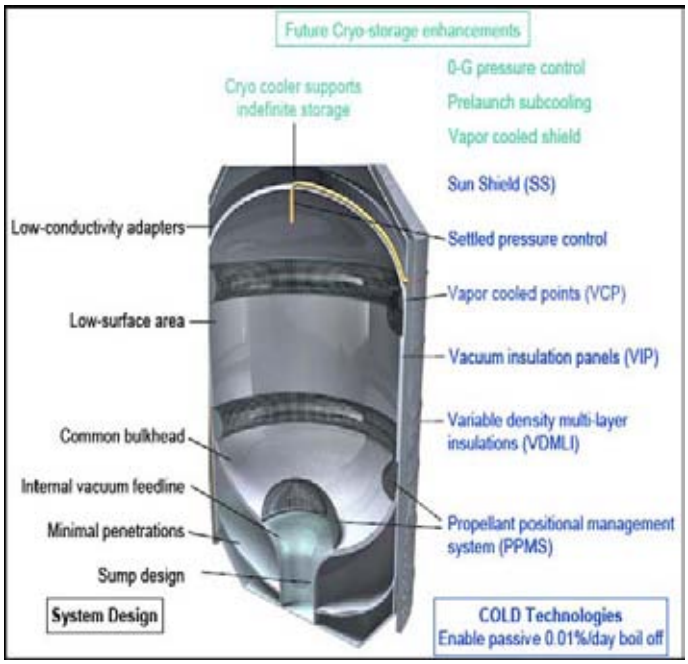
Below: The proposed DIRECT launch manifest. [www.DIRECTLauncher.com]



Above: Jupiter second stage. [www.DIRECTLauncher.com]

Below: Integrated Cryogenic Evolved Stage (ICES). [Image courtesy of Lockheed Martin]



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tons of payload lift performance to LEO. The idea was ignored by ESAS, however, due to an assumption that only Ares-I-style Crew launchers could fly the CEV. This CLV assumption forced the use of a second LV-25 to lift the balance of the necessary lunar payload. Due to these mistaken assumptions, ESAS dismissed the LV-24/25 vehicle as a "3-launch solution".

If ESAS had investigated further, the Crew Launch variant of this launcher, designated as LV-24, achieves all of the stated requirements for crew safety — 17% above ESAS' required minimum 1:1000 LOC (Loss-Of-Crew) numbers — and does so while offering triple the lift performance of Ares-I - 73 tons compared to 22 tons. If LV-24 had been considered as the Crew lifter, to be flown with a single LV-25 Cargo lifter, both crew safety requirements and the payload performance needed for Lunar missions are easily closed in this 2-launch mission profile. Furthermore, being the same launch vehicle (just flown with and without an EDS), development costs are cut in half compared to developing two new launch vehicles. The LV-24 Crew launcher can also fly with an EDS, and still achieve the ESAS' required minimum 1:1000 LOC safety requirements, further increasing performance for the future.

Given the already NASA-approved change from the very expensive SSME to the simpler and less costly RS-68 for powering Ares-V, the same change, when applied to LV-24/25, results in precisely the vehicle DIRECT proposes today. This new vehicle has been named "Jupiter" under the DIRECT architecture.

JUPITER LAUNCH VEHICLE

Safety

High safety numbers and increased performance margins over the Ares-I is one of DIRECT's primary advantages. The higher performance margin and dual main engine configuration of the Jupiter launch vehicle provides the crew of the Orion with the ability to survive an engine-out condition during ascent to orbit, possibly even saving the mission. At anytime after approximately T+45 seconds, the Jupiter could experience a main engine out condition and still achieve a stable orbit for the Orion spacecraft. An engine-out condition on either the 1st or 2nd stage of the Ares-I would immediately cause a Loss of Mission (LOM) with no recourse and would initiate a potentially hazardous abort maneuver.

While both the Jupiter and the Ares-I launch vehicles have a Launch Abort System (LAS), the Jupiter's use of proven systems at lower nominal operational load levels increases crew safety. Additionally, the general arrangement of the Jupiter is far superior to the Ares-I in terms of structural loading and control authority. This enables a wider range of acceptable launch conditions and ascent contingency planning. The Jupiter's LOC is calculated to be only 1 in 1,400 flights due to the vast experience base we have with existing STS hardware; all of which is directly transferable to this configuration.

Performance

ISS, LEO and Cargo-only Missions: The Ares-I lift capacity of approximately 22mT to Low Earth Orbit (LEO) unnecessarily duplicates the performance of the Delta-IV Heavy and the Atlas-V uncrewed launchers. In comparison, the entry-level Jupiter can lift approximately 46mT to orbit on every flight if required. Combined with the significantly larger payload envelope than the Evolved Expendable Launch Vehicles (EELV) or Space Shuttle, even the entry level Jupiter will be able to support a much wider range of crewed and uncrewed missions than America has been able to consider during the last 30 years.

Lunar Missions: The Jupiter Family is a better platform for growth beyond its initial target of ISS support to the more demanding Lunar and Mars missions. Jupiter builds on the ESAS recommendation of utilizing two launches to achieve the total lunar mission mass objectives. ESAS' recommendation was to utilize two considerably different lift vehicles; one small Ares-I for crew, and one very large Ares-V in order to place the combined payload into LEO needed for each lunar mission. Unfortunately, because these two launchers are so different, this approach requires two separate development programs, two operations support systems, and two sets of manufacturing and launch infrastructures. Even more problematic, given NASA's near term budget situation, is that many of the new advanced technology components needed by Ares-V are on the critical path to support the nearer term ISS mission via the Ares-I. By using a "middle ground" DIRECT STS derivative approach, a pair of the Jupiter launch vehicles can deliver more mass to orbit than an Ares-I/V systems, while at the same time sharing only one development program, operation support system, and launch & manufacturing infrastructure. Additionally, the Jupiter Family requires fewer new technologies, which are spread

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more evenly over the entire VSE development program schedule than Ares-I/V.

Mars & Beyond: While no specific architecture has yet been selected for a human Mars mission, most scenarios explored so far require between 300 to 500mT in LEO depending on In-Situ-Resource Utilization (ISRU), architecture and propulsion technologies/assumptions. Because DIRECT can quickly and comprehensively secure the STS heavy lift infrastructure base, a number of other STS derivative options will be available for the human Mars missions, including but not limited to further expansions of the Jupiter family - or even continuing on to developing the Ares-V. Without securing the existing STS infrastructure soon though, our options for Mars will rapidly diminish after the retirement of the Space Shuttle, severely restricting our options many years into the future - regardless of what future STS expansion options one may prefer.

Schedule

DIRECT closes the "gap" between the Space Shuttle's planned retirement in 2010 and the first crewed flight of the replacement Orion spacecraft; today projected for no earlier than late 2015. The current budget constraints interacting with new technologies combined with lower than expected performance margins on the Ares-I will likely continue to push out the first crewed Ares-I/Orion flight. Together these issues require NASA to invest heavily at a time when funds are scarce, all while implementing new technologies in the beginning of the program for long-term objectives without sufficient funding. Unfortunately, this investment results in only duplicating the lift performance of "heavy" versions of existing assets within the EELV fleet.

By contrast DIRECT utilizes the flight-proven RS-68 engines, existing STS four segment SRB's and comparatively minor modifications to the existing STS External Tank structure to create the first variant of the Jupiter family, the Jupiter-120. By leveraging in place Expendable Launch Vehicle and STS production and launch infrastructure we are able to retarget 'long lead time' items for the later Lunar phase of VSE enabling the Jupiter-120 to fly sooner, safer, and with more capability, while retaining all expandability options. The Jupiter-120 is capable of placing 46mT into a 42 x 120 nm orbit at a 28.5-degree inclination, more than double the capacity of Shuttle.

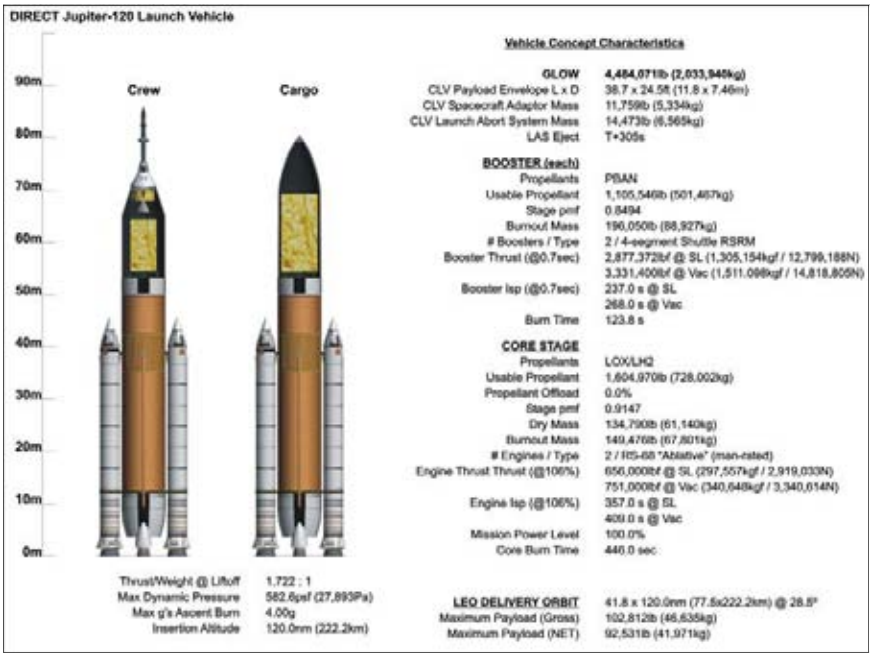
Additional improvements in schedule cost and program risk will also benefit the Orion program. Due in part to the ever-tightening performance specifications of the Ares-I, combined with heavier than anticipated spacecraft elements, Orion is under increasingly stringent mass guidelines. The additional performance margin of the Jupiter-120 can remove most of this pressure. This in turn improves Orion's development schedule and budget for the nearer term ISS mission, helping to close the gap still further. Bottom line: Using the Jupiter launch vehicle, the schedule for fielding the Orion spacecraft can be brought forward by approximately three years, making the Orion operational by 2012.

Ares-I's J-2XD engines are currently scheduled to become operational in 2015. Because this engine is removed from the critical path in support of ISS operations, NASA can save money by extending this schedule two extra years, to 2017, aligning their completion with the high capacity upper stage needed to begin Jupiter-232 lunar operations. The near and long term development costs are considerably lower for DIRECT than the Ares-I /Ares-V combination, which will allow NASA to accelerate the development of other critical VSE elements, such as the Lunar Lander, improving the time frame for the first crewed lunar landing. Thus even within the constraints of the current NASA budget, the objective of returning to the Moon by 2019 should be able to be brought forward by one or two years to 2017 or 2018 using the DIRECT architecture.

THE HARDWARE

Solid Rocket Boosters

The 4-segment Solid Rocket Boosters (SRB) are retained in the DIRECT Architecture without change. The choice to reuse the existing man-rated items means there are zero costs and schedule impacts for these elements of the program. As with STS, these can continue to be reused (there are sufficient SRB parts with service life to support over 600 more 4-segment booster flights, well over 300 Jupiter missions), so all the existing hardware, current facilities and workforce would be retained without change.



Jupiter 120 Launch vehicle specification. [www.DIRECTLauncher.com]

(Continued on page 10)

(Continued from page 9)
These boosters have a perfect flight record of 182 successful uses on Space Shuttle missions since they were redesigned following the loss of *Challenger* in January of 1986. Using the SRB's in an identical configuration confers this demonstrated reliability immediately to the Jupiter for all future human missions to the ISS, Moon, Mars and beyond.

Main Engines

DIRECT proposes to use the considerably less expensive Pratt & Whitney Rocketdyne RS-68 engine borrowed directly from the US Air Force's Delta-IV program, an engine one and a half times as powerful as the SSME, but designed to be inexpensive enough to be disposable.

Unlike the Ares program, DIRECT has retained the performance of the existing engines rather than upgrading them in any way. This removes the significant development costs incurred in requalifying the RS-68 to run continually at the 106% maximum power level needed for Ares-V, erasing all schedule impacts from the development path. Only the process of man rating, such as adding health monitoring systems and backup actuators is required – a task NASA is already considering.

Jupiter Common Cores are designed to fly with either two or three of these engines mounted, depending on the payload requirements. To get the maximum performance from the optional upper stage, three RS-68s are used to create maximum thrust earlier in the flight. For smaller payloads, with no upper stage, two engines offer sufficient performance to lift the vehicle to orbit.

External Tank / Jupiter Common Core

The External Tank (ET) clearly requires some changes to serve as Jupiter's Common Core, however a great deal of the necessary alterations are well within the manufacturing capabilities of the current ET production line based at the Michoud Assembly Facility (MAF) in New Orleans. One specific example: The Jupiter Common Core requires strengthened sidewalls to the tanks and interstage, yet the only change required here is to simply adjust the milling machines to mill less metal during construction – this very simple change would create thicker, stronger tank walls and could be done almost instantly at any time – even while the last Shuttle External Tanks are still being built. Over 70% of all the ET subsystem components can likewise be manufactured, with very little change, with only procedural changes in the manufacturing process at MAF, and do not require any new tooling. Additionally, most of these changes can be performed on the existing manu-

(Continued on page 11)

"Many believe that existing expendable launch vehicles can not be human rated due to inherent limitations to their design and operations because they were not initially designed to be human rated. The results of on-going analysis dispel this belief. Atlas is the only existing launch vehicle that can meet or exceed the identified requirements for providing commercial passenger transportation."

Jeff A. Patton and Joshua B. Hopkins
Atlas V for Commercial Space Transportation

Staying Informed

COMPILED BY THE EDITOR

Because it's August …

The National Hurricane Center
http://www.nhc.noaa.gov/

The Weather Underground: Tropical Weather
http://www.wunderground.com/tropical/

Postcards from the Future
http://www.postcardsfromthefuture.net/

VASIMR News
http://www.reuters.com/article/scienceNews/idUSN1321064820070614?feedType=RSS&rpc=22

National Space Society Space Settlement Art Contest
http://www.nss.org/settlement/calendar/gallery.htm

The Center for Space Standards and Innovation
http://www.centerforspace.com/

The NASA FOIA (Freedom of Information Act) Electronic Reading Room
http://www.hq.nasa.gov/office/pao/FOIA/err.htm

AIAA August is for Aerospace Blog
http://www.augustisforaerospace2007.blogspot.com/

Atlas V for Commercial Space Transportation
http://www.lockheedmartin.com/data/assets/13344.pdf

(continued from page 10)
facturing process lines even while Shuttle ET's continue to be processed.

Due to the higher performance margin of the Jupiter-120 for initial ISS missions, many structural elements can be optimized in an ongoing evolutionary approach, similar to the beginning of the STS program, leading to the Jupiter-232, targeted for the lunar phase of VSE starting 2017. In addition, the entry level Jupiter-120 and later optimized variants become available for a number of future crewed and uncrewed missions not possible now with either the existing ELVs or the projected Ares-I launch systems.

Upper/Earth Departure Stage (EDS)

The basic Jupiter-120 launch vehicle can lift payloads massing over twice as much as any other launcher in the US space program today – civilian or military. But that still is not enough to reach the Moon. Enabling a two launch lunar architecture requires the addition of a large Advanced Upper Stage to the Jupiter. This Advanced Upper Stage will also incorporate a high thrust, efficient, and re-startable, vacuum optimized engine for both ascent and Earth Departure roles. In some scenarios it will also be important for the Advanced Upper Stage to wait in space for long durations until the crew rendezvous, adding the additional requirement of a low cryogenic propellant boil-off rate.

Boil-off with passive systems on the selected ICES (Integrated Cryogenic Evolved Stage) design will be as low as 0.1% per day. Even that could be reduced to just 0.01% per day if active cooling systems (which Lockheed Martin refers to as COLD Technologies) are ever required in the future. Using a pair of the Pratt & Whitney Rocketdyne's J-2XD engines, this stage will have sufficient performance to provide the additional ascent capabilities for all Jupiter launch vehicles, and to also act as a highly efficient EDS. This combination has been verified by the Atlas Centaur Advanced System team. The engines can be gimbaled to drive the thrust vector thru the point where the docking adapter between the CEV and the LSAM is located, intersecting on the centerline of the stack, in the same way that Shuttle's SSME's are vectored for similar reasons. This considerably reduces the possibility of any engine imbalance overstressing the docking port. The addition of this upper stage is all that's required to enable lunar missions matching and even exceeding the Ares in several very important ways vital to the VSE.

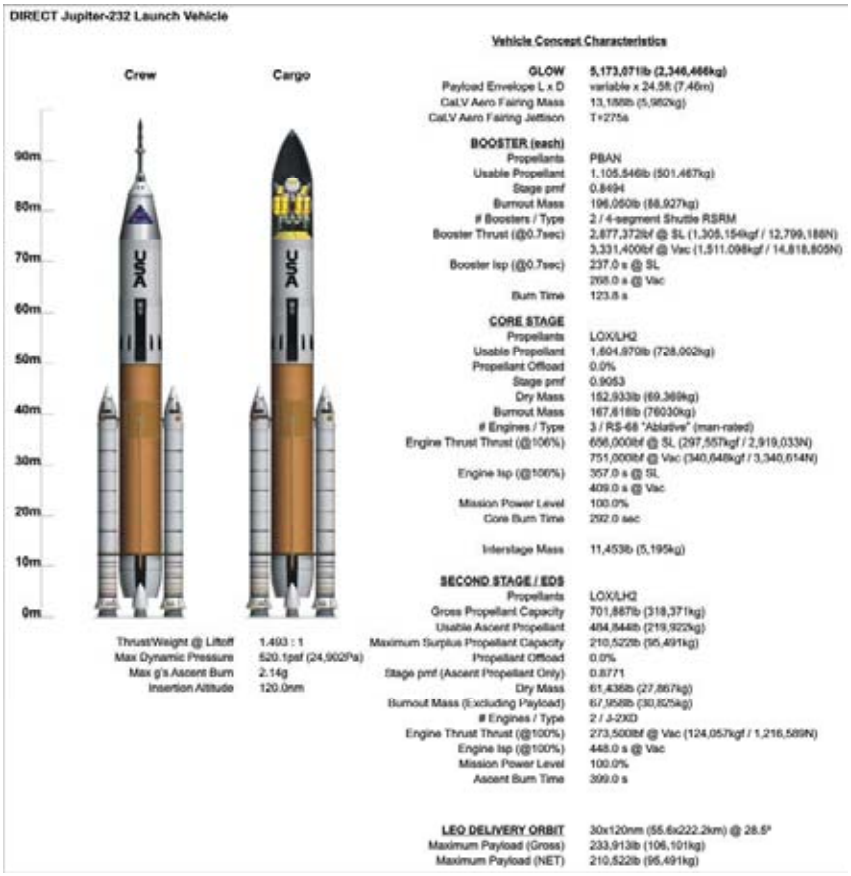
THE "JUPITER" LAUNCH VEHICLE FAMILY

Together, all of these elements create the Jupiter family of launch vehicles.

The naming convention used to differentiate between the different configurations is a three-digit number. The first digit represents the number of cryogenic stages used to reach Earth Orbit Insertion (EOI) point and to properly dispose of the lower stage. The second digit represents the number of main engines on the core and the third digit represents the number of engines on any upper stage – or '0' if no upper stage is to be flown. A pair of 4-segment SRB's is always assumed, but the option exists for "Heavy" variants using 5-segments SRB boosters in the future if requirements justify the expenditure.

Thus, a "Jupiter-120" would be the designation for the initial variant, with one cryogenic stage, two main engines and no upper stage. This vehicle is capable of launching 46mT of payload to orbit (42x120nm, 28.5°) on every flight.

The larger variant we show here is the Jupiter-232, which has two cryogenic stages, three main engines on the first, and an upper stage with two engines. This vehicle is capable of placing ~130mT into orbit (30x120nm at 28.5º). This includes more than 23mT of upper stage mass with the rest being usable payload (which can be a mix of supporting hardware, propellants, spacecraft, modules, etc).



While only 2 Jupiter variants are discussed here, several other variants are possible, including the use of a single J-2XD upper stage and existing upper stages from the EELV program, providing mission designers greater flexibility in matching launch vehicle capabilities to the mission and natural breakout of the spacecraft components.

(Continued on page 12)

Additional DIRECT primary team members:

Steve Metschan is Founder and President of TeamVision Corp, developer of the FrameworkCT software. FrameworkCT is a new class of business intelligence software focused on improving the early decision making process in large and complex organizations. Prior to founding TeamVision, Steve worked for the Boeing company on Advanced Engineering projects for NASA for over ten years. His primary focus was on the integration of Analysis, Design, Manufacturing, Finance and Marketing teams into a cohesive team framework to enhance the understanding of problems and their solutions for advanced space vehicle systems. He earned a B.S in Mechanical Engineering in 1989 from the University of Portland.

António Maia is a Portuguese citizen with background in Physics/Applied Mathematics - Astronomy (Universidade do Porto). He enjoys using self-learned skills on 3D/HTML/Multimedia to implement launch vehicles, spacecraft and other (mostly conceptual) related aerospace and astronautics designs in his favorite space simulator (www.orbitersim.com). Such effort usually results in videos, screenshots and orbitersim addons - freely available online - that everybody can try in the comfort of their home computers to simulate journeys to LEO, Moon, Mars and beyond (as was the case for the initial Direct proposal and for the currently ongoing work). See: http://simcosmos.planetaclix.pt

(Continued from page 11)

CONCLUSION

While the Ares-I/V concept may have been a good idea when first presented, many things have conspired together to cause reasonable people to question its continued viability. There is no question that if anyone is capable of bringing the Ares-I online, it will be the team of design engineers employed by or for NASA and its Field Centers. These are among the brightest, smartest and most capable people on earth. Given a viable task, no matter how difficult it may be, these professionals can get it done.

But the Ares 1.5 launch concept is looking more and more like it might not be feasible, for reasons both technical and political. The political element always plays a vital part in the process and, in the case of Ares, has already begun to take a decidedly negative turn. Recognition of this is what drove the effort to find another way to ensure VSE survival, which is the driving passion behind the DIRECT architecture. The VSE is what will get us beyond Low Earth Orbit. We went to the Moon once, and we should do it again. To do that NASA needs the ability to put Saturn-V class payloads into orbit if the effort is going to be sustainable. The Ares-V could have done that, but now faces the very real possibility that it will never be built; unless some other way is found to preserve the STS manufacturing, servicing and launch infrastructure, the vital heritage which Shuttle leaves to us. Ares-I and Ares-V are conceived as an operational pair, so fielding the Ares-I will also involve implementing extremely expensive and irreversible changes in that infrastructure - to accommodate the very different size and footprint of these launchers from the Shuttle stack size and footprint. Should the Ares-V subsequently be cancelled, there will then remain no way forward to any other heavy lift launch vehicle that needed the STS infrastructure, because it will be gone. Therefore the success of the VSE using Ares depends on both launch vehicles being built, but Congress has not committed to building both.

Congress has committed itself to building only one launch vehicle. The Ares 2-vehicle concept assumes that Congress will also build another, in about 10 to 12 years. But that is 3 Congresses and Presidents away, and the future prospects of the Ares-V are questionable. Due in large part to Ares-I/Orion design issues, even Dr. Griffin has acknowledged that the decision to go beyond Low Earth Orbit will now be left to a future President and Congress. If we use Congress' commitment to build Ares-I and do not get a new commitment 12 years from now to build the Ares-V, another generation will pass before Americans can again entertain the possibility of returning to the Moon. The way to make sure that this does not happen is to ensure the one launch vehicle Congress is willing to fund is capable of going to the Moon. Ares-I cannot do that, while Jupiter can.

The Jupiter Launch Vehicle family preserves the STS stack and infrastructure, and, more than any other concept - including Ares - the highly skilled workforces at KSC, Michoud, JSC, JPL, Ames, Glenn, Langley, and Dryden; at all the Field Centers. It even preserves the way forward for NASA to ultimately build the Ares-V.

Using the Jupiter launch vehicle and its family members, not only is a return-to-flight enabled by 2012, but also the Moon is within reach by 2017. Jupiter provides the science centers with the lift capability we have not had since Saturn was dismantled, opening huge possibilities for science research, robotic probes, sample return flights, planetary orbiters and landers, all unfettered by low lift capacity. Creating the Jupiter launch vehicle family is less expensive than building the Ares-I/V combination, by many billions of dollars, and represents a truly responsible use of the national treasure bequeathed to us from Shuttle, all while duplicating, even exceeding in some cases, the projected mission capacities of the Ares-I/V pair.

In May of 2005, Dr. Michael Griffin said: *"As NASA Administrator, I already own a Heavy Lifter (in) the Space Shuttle stack. I will not give that up lightly and, in fact, can't responsibly do so because .... any other solution for getting 100 tons into orbit is going to be more expensive than efficiently utilizing what we already own."*

On July 16 of this year, at the Heinlein Centennial, he also said: "*Good ideas, in the long run, sell themselves"*. We believe that DIRECT is one such "good idea" whose time has come.

New Members

ALBERT MEZA, MEMBERSHIP CHAIR

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

April
Theodore J Bartkowicz
Mathew Benson
Victor J Bolton
Michael R Cunningham
Robert C Gardner
Karl F Kiefer
Roy E Klusendorf
Curtis E Larsen
Alden C Mackey
Christopher B Prouty
Bruce R Sommer
Jordan M Davis
James M Deyerle
Nicholas A Flores
Frank S Havlak
Joshua D Langsfeld
William C Moonan
Elizabeth A Rowan
Katherine Scully
Chris R Shaw
Yetzirah Y Urthaler
Greg Coker
Robin L Cummings
David I Gill
Sarah S Itz
Michelle E. Roller
Robert S. Smallman
Brian R Dunaway
Chun Yin Fu
Thomas L Patton
D. Alex Young
Robert S Downs
Brian C Owens

May
Sean D Carter
Vincent A Fogt
Xin-lin Gao
Verlin Jacobson
Jaehyung Ju
Richard H Kohrs
David Kortenkamp
Jane T Malin
Sofia Martinez Vilarino
Adam J Wheeler
Manuel A Gonzalez
Bruno Lesage
Jorge O Behaine
Monica R Gutierrez
Dung N Nguyen
Valerie A Worry
Camille W Alleyne
Richard H Kohrs
G Dwayne Orr
Jon K Tice
Daniel Cannon
Benjamin N Cohen
Scott J Hemmen
Amanda K Lampton
Mary J Parker

June
Chakradhar R Byreddy
Glenn L Ellis
Michael Gaboury
Robert E Guinness
Wyatt R Johnson
Jorge L Martinez
James Palmer
Heather Rodriguez
Paul Royall
Victor G. Spencer
Marcos H Valdez
Jason T Vice
Howard A Wagner
Eric R Westphal
Douglas J Zimpfer
Juan A Castilleja
Juan F Duch
Monika Marwaha
Charla F Adams
Cheryl D Adams
Paula J Clark
Angela L Mireles
Jillian K Moore
Harold V Skidmore
Donald C Barker
David Fuller
Harshavardhan A Ghuge
Michael L Jamroz
Wyatt R Johnson
Benjamin W Longmier
Ozden O Ochoa
Brian K Alpert
Jason Gabbert
Christopher L Harrison
Tudor Palaghita
Kristina Rojdev

July
Daniel J Barta
Michael D Bjorkman
Michael L Coats
Cami Dutton
Joe Hammond
Marvin L Leblanc
Zane Ney
Luis A San Andres
Mark R Sandberg
John H Scott
Ravichandra Srinivasan
Lucas D Ward
Janet R Edwards
Ada Rivera
Shiladitya Basu
Shawn E Gano
James K Gilbert
Kan Kobayashi
Leonard S Nicholson
Farid K Rafla
Patrick E Rodi
Jerry B Sanders
Devon S Sanders
Everett L Bolduc
Kristen K John
George W Lefelar
Tanner L McKee
Linda Phonharath
Alec Sabin
Matthew J Schwaab
Justin R Thompson
Truong-Dzuy E Truong-Cao
Tiffany D Williamson
Langston B Teel

Important notes:

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

Nominate a Colleague for One of AIAA's Top Awards

Do you know of a colleague who has made significant contributions to aeronautics or astronautics or to AIAA? Nominate them for one of AIAA's top awards.

Click Here

Or visit www.aiaa.org

Update Your Membership Records

Please verify 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).

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 albert.f.meza@nasa.gov

Sarah L Bibeau
James Boyd
Capt. Frank L Culbertson
Yuanyuan Ding
Joshua Newhouse
Ryan Sager
Frieda Y Wiley
Leonard D Cassady

History

AIAA Historic Aerospace Site Plaque at NASA/JSC

AARON MORRIS, HISTORY CHAIR (2006/7)

The Johnson Space Center was designated as an AIAA Historic Aerospace Site by the AIAA and the dedication ceremony was conducted on June 21, 2006. The

Above (pictured from left): Steve King (AIAA 2006 Houston Chair), Aaron Morris (2006 AIAA History Chair), Milt Heflin (NASA JSC – Invited Speaker), and Michael Coats (NASA JSC – Center Director)

"AIAA Historic Aerospace Sites Program" was started in 2000 to recognize sites in our history that contributed to the advancement of the aerospace field. Examples of sites already designated include the Boeing Red Barn, the site of Robert Goddard's first rocket launch, NASA Marshall Space Flight Center, NASA Langley, First Balloon Launch Site Annonay France, Kitty Hawk, and Tranquility Base.

Steve King, Chair of the Houston Section, presented the plaque to the Johnson Space Center Director during the dedication ceremony on June 21, 2006.

Recently, the plaque was permanently mounted on a granite stand at the entrance to the Rocket Park at the Johnson Space Center.

The primary motivation of the Historic Sites team has been the fact that The Lyndon B. Johnson Space Center (JSC) has played a vital role in all human space exploration programs from Gemini, Apollo, Skylab, Space Shuttle, through the International Space Station; and is at the forefront in making future expeditions to the Moon, Mars, and beyond a reality. As a result, we believe that this site deserved recognition as a Historic Aerospace Site. The recognition of the Johnson Space Center and feelings of the AIAA Historic Sites team can be summarized with the wording of the plaque:

American Institute of Aeronautics and Astronautics
Historic Aerospace Site

NASA Johnson Space Center (Houston, Texas)

Since its establishment in 1961 the Johnson Space Center (formerly the Manned Spacecraft Center) has led America's efforts in human space exploration. The numerous contributions of this site include advances in spacecraft development and life and space sciences – as well as for hosting Mission Control and the Astronaut Corps. The Johnson Space Center has played a vital role in all human space exploration programs from Gemini, Apollo, Skylab, and the Space Shuttle, through the International Space Station, and it is at the forefront in making future expeditions to the Moon, Mars, and beyond a reality.

Our next Houston area target for this honor is the 1940 air terminal building at Hobby Airport, which can be seen on the web at www.1940airterminal.org.

Below and right: Historic Sites Plaque displayed in Rocket Park. – Photo Chester Vaughan, 2007 AIAA History Chair

Virgin Galactic Training for Travel Representatives

TARA HYLAND, NAVIGANT VACATIONS

Feature Article

In October 2007, I learned that Virtuoso, the exclusive travel network of which Navigant Vacations is a member, had signed an agreement with Richard Branson's Virgin Galactic for Virtuoso travel consultants to exclusively represent Virgin Galactic in North America.

The candidate application process to become a Virgin Galactic Accredited Space Agent included an essay on why I would want to be among the first to sell civilian space travel. Additionally, it contained questions about my travel career, community involvement, networking, and potential customer base for civilian space flights. Out of 140 applicants, I was one of 46 in North America selected for the program.

I firmly believe that I was selected because of the essay portion of my application. I wrote of my personal passion and fascination with man's history of flight and the fact that I grew up in the Houston Bay Area in the era when the Johnson Space Center was first established. Growing up in the area I had friends, neighbors and travel agency customers who were pioneers in early days of the Gemini and Apollo programs. I wrote of the pleasure and excitement of vicariously experiencing the history making successes of the programs. I also wrote of the sense of community in the Bay Area and the profoundly shared grief when the program had failures and how those impacted everyone.

I explained the absolute honor and privilege I would feel to be a part of the future of civilian space travel, one of the next frontiers of man's history of flight. Being a part of the Virgin Galactic program and having the ability to offer civilians the opportunity to fulfill their dreams of space travel would certainly be the highlight of my career.

In February of 2007, all 46 Accredited Space Agents gathered at Kennedy Space Center for training by the Virgin Galactic team.

Why should humans go to space? What has it given us so far? Is there any more to learn? Principles of Space Flight, The Birth of Virgin Galactic, The Future of Commercial Space Flight, gravity, g forces, SpaceShip2, White Knight 2, Launch Systems, Virgin Galactic Technology, PR Guidelines, Booking Procedures, Medical Program, Client Retention, Who Can't Fly, Rocket Science for Accredited Space Agents.

When I first saw these agenda topics (in my Virgin Galactic Mission Handbook) for my Accredited Space Agent training, I wondered how we could cover so many interesting and complicated topics in just two days. The answer—an incredible team of Virgin Galactic key personnel, each with his/her own area of expertise to immerse us in an organized, exciting, and thorough accreditation program.

On our first day, Carolyn Wincer, head of Astronaut Sales, explained that the goal of training was to give us mission-critical information to answer queries from prospective clients. The training information was designed to give us a broad understanding of how spaceflight works, why Virgin Galactic's technology is sound, and to give us an understanding of how it compares to other space flight systems.

We learned that civilian suborbital flights are at the dawn of what Virgin Galactic hopes will be a new age of human commercial spaceflight. As the program progresses, Virgin expects to drive prices down and invest in new areas of space technology. The future implications for commercial flights are enormous. Imagine point-to-point flights via space that could enable passengers to travel from London to Sydney in less than an hour. Sir Richard Branson's goals include developing bio fuels to make all types of aviation friendlier to the earth's environment.

Alex Tai, one of Virgin Galactic's chief pilots and COO of Virgin Galactic spent several hours explaining the technical aspects of the Virgin Galactic flight experience. We learned that the horizontal air launch from White Knight 2 at 50,000 feet is much safer than a vertical launch. Spaceship 2 will use a hybrid-fueled rocket that can dump fuel and glide back to earth should something go wrong. The Burt Rutan award winning wing-feathering technology means that re-entry is relatively carefree, and cool.

Our experts from Virgin explained that the spaceflight itself is the icing on the cake. The Virgin Galactic experience will last for three days. It will offer preflight training, final medical evaluations, space suit fittings, educational seminars and the actual flight simulation conducted by the flight pilots. The two-hour spaceflight will include an exhilarating launch, awe-inspiring views from 68 miles up, and the experience of weightlessness for 4 minutes. And then there is the exciting reentry, experiencing up to 6 g forces and the glide back down. The event will conclude with an award celebration, presentation of Virgin Galactic astronaut wings and memories to last a lifetime!

The first flights will launch from Mojave, California, in the latter part of 2009 or early 2010 with future flights projected to launch from New Mexico's new Spaceport scheduled for completion in 2011. Richard Branson's plans include a resort hotel in New Mexico with luxury amenities to ensure the families of those flying will also have a memorable experience. (*continued next page)*

(Continued from page 15)
The decision to hold our training at Kennedy Space Center was an excellent one because it used the memorabilia of NASA's history making programs as an awe-inspiring backdrop. The realization that we have an opportunity to reserve seats on Virgin Galactic space flights is amazing. Our customers will have the opportunity for the ultimate adventure travel experience and make history doing it!

Virgin Galactic CEO Sir Richard Branson holds a conceptual SpaceShipTwo model. [Image courtesy of Virgin Galactic]

The final event of our training was a graduation banquet that was held in the Apollo-Saturn 5 Center with a private champagne reception as we watched video of Apollo flights and commentary by the astronauts who flew those amazing missions. Our dinner was held under the second stage of the enormous Saturn 5 rocket. It was an incredible way to conclude our training,

The evening ended with the 45 Virtuoso agents receiving our Virgin Galactic "Accredited Space Agent" certificates and lapel pins by Alex Tai, chief operating officer of Virgin Galactic, and Matthew Upchurch, CEO of Virtuoso.

My mission now focuses on marketing and selling Virgin Galactic Space flights. We received excellent press during our Kennedy training when the Today Show filmed it and aired a segment on the show. Subsequent Virgin Galactic press releases led to call from the Houston Business Journal which ran a cover story on December 29, 2007. Diane Vest, another Accredited Space Agent and I also received the cover story on the front page of The Citizen on February 8, 2007. Following this story, I was contacted by Ted Oberg of the local Houston ABC affiliate who interviewed Diane and me and ran the story several times on Channel 13 in March, 2007.

I was invited to speak at the annual banquet of the Society of Women Engineers in April and the May AIAA symposium as a non technical workshop speaker. I have been extremely pleased by the encouragement and support I have received from the NASA community. As a result of one of my speaking engagements, I do have a Virgin Galactic prospect who intends to deposit a flight within the next 8 weeks. I am extremely excited for my prospect who has a keen interest in astronomy and is very eager to be among the first civilians in space and help pave the way for others.

My future marketing plans include more speaking engagements, consumer events, press releases, television interviews and networking.

A very exciting consumer event will occur August 17-18 in Las Vegas when Virtuoso and Virgin Galactic will team up with Zero G offering a Virgin Galactic prequel with a 2 night package at the Bellagio, a Zero G flight and a Virgin Galactic party. This package is offered at a very reasonable rate in hopes that the Zero G flight experience will be so exciting that consumers will then begin to dream about and book a Virgin Galactic flight.

I look forward to the day when I will have the opportunity to sit in White Knight 2 and Spaceship 2 and hope that in the future, the Accredited Space Agents will be given the opportunity to fly . At this time, I am waiting for an Accredited Space Agent discount ! I am ready to fly.

If you would like to learn more about the Virgin Galactic program, Tara Hyland can be reached at 832-439-7363 or tara.hyland@navigant.com.

The 2007 Annual Technical Symposium

Summary Report

ELLEN GILLESPIE

The 2007 AIAA Annual Technical Symposium (ATS) was held on Friday, May 11th at the JSC Gilruth Center. This all-day event was open to NASA/Johnson Space Center (JSC), JSC contractors, industry, and academia. Twenty five papers were presented in two morning and three afternoon sessions which included topics on: Space Exploration, Space Shuttle, International Space Station, Robotics, Space Commercialization, and Aerospace Technology.

ATS started at 7:45 am with speaker registration. The registration fee for ATS was $5.00 for speakers and $10.00 for non-speakers, which allowed all interested parties to attend the conference as time permitted. Reservations for lunch were the only arrangements that ATS attendees were required to make before the conference, and the cost of the Continental breakfast and Italian lunch buffet was included in the registration fee.

The morning keynote speaker was Anne Martt, the USA Constellation Program Manager. The USA Constellation presentation was entitled "Constellation: The Journey Ahead" and included a movie on CEV operations.

Each of the two conference tracks started at 9:00 am with introductions by the morning Session Track Chairs. Three hours of 30-minute presentations were conducted in three sessions. The first ever ATS poster session was held as an optional third track, and included posters from Boeing and the Houston Rocket Club.

Lunch was served in the Gilruth Grand Ballroom, and was followed by a Constellation seminar given by Lockheed Martin/Blaine Brown. ATS attendees were provided a valuable opportunity to take part in a Question and Answer session on Constellation topics with both morning and afternoon keynote speakers.

Individual presentations resumed at 1:30 pm after an introduction given by each of the afternoon Session Track Chairs. Three sessions of afternoon topics were held on the following topics: Modeling and Simulation, Space Commercialization, Aerospace Technology, and COTS Software.

ATS 2007 had an excellent program, and attendance was over 115. ATS was made possible with the support of NASA, was organized by the ATS Planning Committee, and was sponsored by Lockheed Martin, USA, Jacobs, and ATEC. The ATS Planning Committee was composed of AIAA volunteers from NASA, Honeywell, Boeing, United Space Alliance, MRI Technologies, and NASA retires.

Keynote Speaker Anne Martt, Constellation Program Manager at United Space Alliance.

More details are available in the program document at http://www.aiaa-houston.org/ats2007, where we plan to post presentations from some of the speakers. Similar documentation from past years is on display at the web site. Please join us next year as an attendee, presenter, or volunteer.

Student Essay

To Boldy Go

JARRET M. LAFLUER, AERO ENG. GRADUATE STUDENT, GEORGIA TECH

In kindergarten, if you had asked what I wanted to be when I grew up, it wasn't the typical president, astronaut, or professional athlete. Rather, I wanted to be a school bus driver. After all, I needed the bus driver to bring me to and from school at speeds exceeding 30 mph on roads with names I couldn't even spell! In the following years, though, I gained more perspective, and by high school I began aiming more toward lasting contributions to human knowledge. I saw the greatest potential for this in the exploration of space, and I wanted to design the vehicles that would take humans where truly no one had gone before.

Recently, I've been in meetings with the NASA-wide Mars Architecture Working Group, and my job this summer is to optimize entry trajectories for future human Mars missions. Ultimately, this is aimed at guiding technology and architecture decisions for the next decades. When I step back and think about it, I'm having a hard time fathoming the magnitude of this whole endeavor. As an aerospace engineer, I'm actually figuring out how mankind will get to Mars. How many other professions are focused so extensively on pushing the frontiers of human knowledge and capability? How many others are bold enough to entertain dreams like morphing airplanes, hotels in space, bases on the Moon, and humans walking on Mars?

When I was graduated from high school in 2002 in the rural town of Burrillville, Rhode Island, I never imagined the experiences I would gain over the next five years. As an undergraduate at Georgia Tech, I had the chance to participate in design studies for tanker aircraft, single-stage-to-orbit launch vehicles, and unmanned asteroid missions. I became a researcher in the institute's Space Systems Design Laboratory and worked on Mars airplanes, Titan helicopters, and human Mars missions.

Early in my undergraduate career, I interned in Rhode Island at the Naval Undersea Warfare Center's acoustic wind tunnel. Soon after, in Fall 2003, I began as a co-op student at Johnson Space Center. During my first tour in the Mission Operations Directorate, I worked on operational concepts for the Orbital Space Plane. During my second tour, I tackled capsule impact modeling within the Engineering Directorate, and for my third tour I traveled to White Sands and contributed to an agency-wide effort to solve Shuttle External Tank icing problems. In Summer 2006, I worked again in the Mission Operations Directorate, but this time on contingency entry scenarios for the unmanned Mars Science Laboratory mission.

My undergraduate experiences have been as challenging as they have been diverse. I've realized they have taught me not only thermodynamics and astrodynamics, but also some important lessons about the aerospace industry:

5. Flying is hard. Okay, this isn't entirely true. Flying isn't really hard. Landing is hard. Taking off is hard. The middle is a piece of cake as long as your engines, navigation systems, controls, guidance, communications, environmental systems, structural elements, and power systems are working right.

4. Anything can fly given enough engines. Enough said.

3. Flying is an art. Not only is the act of flying a bit graceful, but so is the process of design. Efforts to make the design of flight vehicles more systematic are ongoing, but the fact is that to a large extent, the industry still relies on disciplinary experts to provide insight that is currently only available because of their vast, focused experiences.

2. Articulating "why" is important. Not only do aerospace professionals need to know their specific disciplinary areas, but they need to know the big picture. However, it is equally imperative that they are able to tell the layman what they do, what their organization does, and why it's important to society.

1. Aerospace professionals are passionate. From my experiences, I truly believe the aerospace industry has some of the most devoted employees in the world. I know of no aerospace professional who is in it for the money nor any who bemoans the fact that he is working on the most complex machines in the world. A friend from my graduating class often says to me, "Hey Jarret, guess what?" Typically I will respond, "What?" And, with a huge smile, she always replies, "Now I'm an aerospace engineer!!" You just don't get that in dentistry.

In any case, I now have an aerospace engineering degree under my belt and decided I liked it so much that I'm going for two more. I'm currently a graduate co-op in the JSC Engineering Directorate working on Mars entry for human missions. I plan on continuing through a Ph.D. at Georgia Tech, and provided I can survive that experience, I aim to continue to push the capabilities and knowledge frontiers of mankind. The outside of the envelope has never seemed closer.

You're a GO for Launch

Student Essay

LINDSAY MAREK, AERO. ENG. STUDENT, UNIVERSITY OF COLORADO, BOULDER

The night was crystal clear in the Colorado Rocky Mountains, and I was lying on my back looking up towards the sky. As I searched for the Big Dipper, a shooting star flashed through the sky. I started thinking about what it would be like to float through space and explore other planets in the same way I explored the mountains. From that moment on, I was hooked.

From the time I was young, I knew I was different from most kids my age. When asked what we wanted to do when we grew up, most would answer, "I want to play in the NBA" or "I want to be a singer". I wanted to be an astronaut. I got teased when I worked on a research project on the MIR space station because everyone else thought I was a nerd, but that never discouraged me.

I grew up, but that didn't mean that I grew out of my dreams – they were huge and I had a lot of growing to do. I graduated high school and decided to attend the University of Colorado at Boulder. It was close to the mountains, it had a nationally ranked aerospace engineering program, and, last but not least, it was ranked third in the nation among public institutions for the number of astronauts who had graduated from the University. It was the perfect place for me!

In my freshman year, I took a course called Introduction to Aerospace Engineering which exposed me to the many different career paths that can follow the completion of an aerospace engineering degree. However, one opportunity caught my attention for two reasons: I didn't have to wait until I graduated and it would drop me straight into the heart of the human space flight program. The opportunity was the Cooperative Education Program at Johnson Space Center in Houston, Texas, and I applied right away. After one interview and three painstaking months of waiting for a reply, I was accepted into the program. Needless to say, I was ecstatic!

Since giving up the mountains and moving down to Houston (only temporarily, though), I have had so many amazing opportunities that I don't know where to begin. I have met Apollo astronauts like Neil Armstrong and John Young, and I have watched the movie *Apollo 13* in the Historic Mission Control Center where Flight Director Gene Krantz stood and brought the crew home safely. I once participated in ascent training with a crew of astronauts in the motion based simulator then traveled to Kennedy Space Center in Florida and on July 4, 2006, saw the launch of that crew I trained with. That was the first Shuttle launch I had ever seen, and watching the smoke and flames billow from the main engines and the solid rocket boosters as the Shuttle climbed toward the sky was a sight I will never forget. I felt the rumble in my chest as the Shuttle left the launch pad and I almost had to pinch myself to make sure I wasn't dreaming.

In the course of my work at JSC, I have certified as a flight controller for the International Space Station and helped design the life support systems for the new space suits for lunar exploration. I have worked closely with other astronauts for research, and I've supported many different developing space suit equipment tests and wind tunnel tests. I am currently working with the aeroscience and computational fluid dynamics (CFD) group. I use wind tunnel test data to validate the use of CFD simulations for Shuttle re-entry, and I am helping with the development of the Shuttle tile repair techniques. I have developed analysis tools to be used on the day of launch, and I have supported Shuttle missions on the ground.

All of these experiences have reinforced my desire to continue working in the field of human space flight. Each day I learn something new or meet someone new that inspires me to keep dreaming big. I will finish my undergraduate degree in aerospace engineering with one more year of hard work, and then I would like to continue on with a graduate degree. I plan to stay involved in human space flight throughout my graduate studies and eventually work in the field full time. I continue to reach for the stars in everything I do with the hope that one day in the future I will sit on the launch pad as part of a crew and hear the words from the control room, "You're a go for launch!" as the engines below me begin to roar.

The Engineering Sciences Contract Group (ESCG)

KIRA BLACKWELL AND ESCG STAFF

Jacobs Technology and its teammate companies—Barrios Technology; ERC, Incorporated; GeoControl Systems; Hamilton Sundstrand; and MEI Technologies—began work on the Engineering and Science Contract (ESC) February 1, 2005. NASA awarded the contract to the ESC Group (ESCG) to provide support to the Johnson Space Center (JSC) Engineering Directorate and the Astromaterials Research and Exploration Science (ARES) Directorate. Much of the job involves engineering products and services for the Space Shuttle Program, International Space Station Program, and Crew Exploration Vehicle Project Office. Technical, engineering, and property management expertise is provided to support the maintenance and operation of approximately 130 research, development, and test facilities and laboratories at JSC. ESCG also supports ongoing NASA missions to meet the challenge of the President's Space Exploration Initiative issued January 14, 2004.

Serving the Community

Having celebrated its 2nd anniversary last February, ESCG can reflect on its accomplishments in the aerospace industry and in the local community. By volunteering their time and resources, ESCG employees have helped multiple charities in Clear Lake and the surrounding area; e.g., the Children's Miracle Network of the Greater Houston Area that enables underprivileged children to receive optimal pediatric healthcare services at Texas Children's Hospital; Habitat for Humanity, an international organization that builds affordable housing for low-income families; on-the-job food drives in conjunction with the Spirit of Texas Food Drive and the Houston Food Bank; annual March of Dimes campaigns to raise funds to assist premature babies; the United Way of the Texas Gulf Coast. Employees annually organize a Juvenile Diabetes Research Foundation (JDRF) fundraising drive, collecting $13,000 in 2006 to make it one of the highest contributors to JDRF in the area.

Inspiring the Young

To fulfill the vision proposed for NASA by President Bush, we must inspire today's young people to pursue careers in math and science. Several ESCG employees worked with the 2006 "*For Inspiration and Recognition of Science and Technology*" (FIRST) Lego League Lone Star Robotics Tournament through the University of Houston, an educational outreach of the JSC Automation, Robotics, and Simulation Division. ESCG personnel also supported the 2007 FIRST Robotics Competition.

ESCG employees supported the NASA Education Outreach Program, High School Students United With NASA To Create Hardware (HUNCH), a program started in 2003 to give students the opportunity to collaborate with NASA employees and build actual space station equipment and training hardware. Student participation has grown from 60 to more than 600. Hardware created by the students includes station stowage lockers, light fixtures, medicine cabinets, caution and warning panels, and replicas of the station audio terminal units. Before participating in HUNCH, many of these students had not considered working in the math or science fields, much less at NASA, but the next generation of explorers is being inspired by working with space industry professionals through HUNCH.

Educating Students at Work

The ESCG Cooperative Education Program allows college students to apply classroom theory in a professional setting while gaining personal, academic, and occupational skills. ESCG mentors integrate classroom theory with workplace practice, helping students formulate career goals and determine if they enjoy working in the aerospace field. Some institutions provide academic credit hours for information students learn on co-op assignments.

Supporting Return to Flight

As NASA prepared *Discovery* for a return to flight after the 2003 *Columbia* tragedy, ESCG personnel worked hard to resupply the International Space Station (ISS) and develop major science hardware. The minus-eighty-degree laboratory freezer for ISS was completed to support biological experimentation aboard ISS; two cure-in-place ablator main units and reinforced carbon-carbon repair tools were delivered for the STS-114 2005 launch; and the Wing Leading Edge Impact Detection System was installed to record data during shuttle ascent, store and process the data on-orbit, and transmit the data to the ground for analysis at Mission Control to identify any foreign object impacts on the wing.

ESCG employees contributed to the Orbiter Boom Sensor System (OBSS), a critical system flown on STS-114 to verify that the vehicle was sound enough for reentry. Viewing the shuttle tiles after orbit was achieved by using the OBSS, a 50-foot boom with laser sensors, to scan the shuttle to determine if damage had occurred.

Another key project was the Digital External Thermal Tank Protection System (DETTPS) camera project, which provides pictures of the external tank as it separates after launch. The camera system on preceding missions consisted of a traditional film camera, allowing images to be viewed only after completion of the mission. The DETTPS camera uses digital imagery downloads from the camera to the crew laptops while on-

(Continued from page 20)
orbit and to Mission Control before shuttle return.

ESCG also supports the JSC Engineering Directorate in real time during space shuttle missions. A recent example in which ESCG engineers provided critical support was in the STS-117 OMS Pod thermal blanket damage assessment. ESCG personnel are also helping with simulation development and analysis for Constellation activities including ascent and entry abort analysis.

Capturing Stardust

The Stardust mission sample capsule safely returned to Earth January 15, 2005, completing a 7-year journey of almost 3 billion miles through space to gather comet samples. Investigators at JSC are currently evaluating the tiny particles captured in aerogel. The particles will provide clues to the formation of the solar system.

After a record-setting 28,800-mph reentry, the spacecraft landed safely at the Utah Test and Training Range (UTTR), bringing to Earth the first comet dust ever collected. The payload was flown to Ellington Field and delivered to the clean rooms at JSC. Preceding the arrival, a completely new clean laboratory was built, new instruments were designed, and critical logistics were provided for retrieval of the payload from UTTR. ESCG personnel developed much of the hardware and sample processes and traveled to Utah to prepare for and recover this incredible spacecraft. The extended team of ESCG researchers and curation staff from ARES contributed significantly to this effort and will continue to work for several years to fulfill the scientific goals of the mission.

Looking to the Future

ESCG was selected to provide the Crew Exploration Vehicle (CEV) Parachute Assembly System for the Constellation Program, which will provide humans the capabilities necessary to travel and explore the solar system. Much like the Apollo Program of the 1960s and 1970s, parachutes will be used as the primary landing system for the CEV for normal (land) and abort (land or water) landings on Earth. An ESCG team is leading the design, development, testing, qualification, and certification of the parachute system. The overall landing system for the CEV will consist of the ESCG-provided parachute system, a landing attenuation system for landing on dry land, and a self-righting and flotation system for water landings. The first delivery of flight units is slated for fiscal year 2009.

While reflection on past successes is wonderful, Jacobs Technology looks forward to working with NASA to accomplish great things. Diverse personnel backgrounds provide innovation, creativity, education, experience, dedication, and sacrifice, all of which are essential elements in the aerospace industry. With a savvy workforce leading the way, Jacobs Technology will advance into a bright future with ESC.

Employment Notice

CEV Simulation Integration Specialist/#1059
Jacobs Technology/ESCG
Houston, TX

Jacobs Technology is recruiting for a CEV Simulation Integration Specialist on their ESCG contract in Houston, TX. This position requires a minimum of a BS degree in a technical field from an accredited university and normally should possess at least five years direct experience with large scale simulation integration and configuration management processes; prefer degree in Engineering or Computer Science. An MS is preferred. Ability to identify Integrated Guidance, Navigation, and Control (IGN&C) performance related issues and assist developers to resolve response differences due to code modifications. Strong background in LINUX, C/C++ code development, and scripting languages is required. Experience with the TRICK simulation architecture and the IBM ClearCase configuration management tool is desired. Must have excellent communication skills and the ability to work in a team environment. Must meet eligibility requirements to receive and maintain a DoD security clearance. Management has the prerogative to select at any level for which this position has been advertised.

Perform as lead integrator for the CEV Orion ANTARES GN&C simulation. Integrate model updates from GN&C Orion team members, identify performance related issues due to code modifications, and work with developers to resolve performance issues. Use the IBM ClearCase and DDTS configuration management tools to control the configuration of simultaneous vehicle configurations in a concurrent engineering development activity. The candidate will be responsible for version control, discrepancy tracking, regression testing, baseline releases, and the generation of supporting documentation. Use scripting languages to create tools for simulation users/developers. The candidate will assist users in answering questions regarding simulation configuration management, simulation architecture and code development, and user/developer processes. Other duties will be performed as required. We offer a full benefit package.
Jacobs is an EEO employer.

To apply and view our other openings visit our website at: www.jacobstechnology.com

Space Settlement Design Competition

DOUGLAS YAZELL, CHAIR

Nearly 150 students from around the world gathered into four teams and journeyed to the NASA/JSC Gilruth Center from Friday through Monday, July 20-23, 2007, for the 14th Annual International Space Settlement Design Competition (SSDC). Chaperones, parents, and other helpers sacrificed their time and energy to travel with them from their home areas. Only one team won, but all the students benefited and enjoyed the event, as seen from the number of them who have participated in more than one year of SSDC (http://spaceset.org).

Photos above and below, SSDC, March 2007.

The first SSDC was held in 1984 at Ohio State University. Anita Gale, Dick Edwards, and Rob Kolstad are the names mentioned most often in this year's program book as founders at that first event, and all three of them were back for more this time. SSDC is an industry simulation game for high school students, set in the future. The teams emulate aerospace industry proposal teams.

Each team is assigned someone from industry or NASA to serve as CEO, and all team members receive Saturday morning training at SSDC to prepare them for the competition. Each team selects, from the students, a president, two vice presidents (engineering and marketing/sales), and four engineering directors (structural, operations, human, and automation). Remaining student members work with one of those four directors. The competition concludes with team presentations of 35 minutes each and written proposals (50 charts maximum) submitted to a panel of critical judges.

This SSDC was sponsored by AIAA Orange County Section of California. Financial support was provided through the Johnson Space Center SSDC, sponsored by Dow Chemical Company and The Western Hills Area Education Agency in Iowa. Any high school in the world is invited to submit a proposal for the International SSDC.

"Now you know what it's like in industry!" This exercise is amazingly well-organized and supported, but it simulates the real world very well, so the teams are taught to keep that sentence in mind. Each of these four teams of about 36 people each was composed of at least three teams that had competed in prior SSDC's. Each of the four teams had at least one third of its membership from a foreign school. Foreign countries represented this time were India (3 schools), Australia (3 schools), Romania (two teams from one school), and Uruguay (one school). The USA was represented by four schools (from California, Colorado, Maryland, and Florida) and one group from Iowa and Texas.

I was a CEO this time and once before this past March. I learned as much as anyone there and I am eager to return. On Monday at a theater in Space Center Houston, Tara Shultz of Dougledyne Astro-Systems Flechtel Constructors (an Australian girl) won the "Jingle" Lutz AIAA award for best female presenter. Team names were Dougledyne, Grumbo Aerospace, Rockdonnell, and Vulture Aviation. Grumbo took the prize this time, and then a special guest reminded all of us how to keep it in perspective. Special guest American astronaut Sunita Williams spoke to the crowd and stayed for pictures, not long after her return from space on June 22, 2007. After her first mission to space as a member of the Expedition 14 crew on the International Space Station, she now holds the female world record for the number of spacewalks with four, and she logged 195 days in space. That was a good note for ending another exhausting and inspiring weekend with SSDC.

The International Space Development Conference 2007

Conference Summary Report

BEATRIZ A. KELLY-SERRATO, MEMBER AIAA

The best description I'd place on the International Space Development Conference 2007 (ISDC) is that it was a smorgasbord for the modern space conference attendee. According to the ISDC description in the National Space Society (NSS) summary for this conference, "Texas stands on many frontiers in history, and now it stands on the doorstep of the space frontier." Nothing could be truer. This JSC contractor entered the Dallas Intercontinental Hotel on the 23rd of July 2007 to find her way up to the conference area. The registration process was frantic!

First, I attended the Space Venture Symposium (the SVS – a precursor to the conference). The SVS was a gathering of "Angels". For those who don't know what I am talking about, Wikipedia defines an "angel investor" (known as a "business angel" in Europe, and here in the USA, simply as an "angel") as affluent individuals who provide capital for a business start-up, usually in exchange for ownership equity. Angels typically invest their own funds, unlike venture capitalists which combine the pooled money of others in a professionally-managed fund. However, a small but increasing number of angel investors are organizing themselves into angel networks or angel groups to share research and pool their investment capital. Rick Tumlinson of Orbital Outfitters (a company which – as the name suggests – designs space-wear and space-gear; his was one of the businesses that hopes to woo an angel investor for funding. Rick was also a panel member who was present to provide inputs regarding his company and how they plan to reshape the future by offering space-gear. [I asked Rick to put in my order for a snazzy black suit, streamlined, yet still preserving the female physique!]. Rick's Company apparently intends to keep those concepts in their designs. Lon Levin was teamed with Rick as they both bantered and answered questions regarding business strategies, space corporate law, and the best way to approach angels or venture capitalists for funding. Lon Levin is the Chief Strategic Officer for t/Space Corp.

After this wonderful 30 minute kickoff, we entered a panel discussion, "Venture Capital Financing of (Aero) Space Firms and Technologies" featuring Peter Banks (Red Planet Capital), John Higginbotham (Space Vest), George Petracet (Atrium Capital), and Mohanjit Jolly (Garage Technology Ventures) during which we listened intently about money and financial matters. Everyone in the room was writing down all that was said as they were interested in all of the intricacies for securing capital. The last panel before the lunch break was led by Kevin Sheehan, Paul Cuatrecasas, and Joerg Kreisel. The title of their session speaks for itself, "Private Equity and Investment Banking in Early- and Mid-Stage Financing of Commercial Space Firms".

Our luncheon speakers were Thomas B. Pickens III, President and CEO of SPACEHAB, Inc. and managing partner of Texas Nanotech Ventures, along with Esther Dyson of Edventures Holdings. David Lackner, Bio-Info Nano Research and Development Institute (University of CA & NASA Ames) would entertain us during lunch. Mr. Pickens was our keynote while Esther and David provide our emcee support. The rest of the SVS consisted of an in-depth discussion of corporate investments, state and private equity financing, and finally angel investment in "seed stage" commercial space startup companies. One activity I found interesting was a presentation during which the angels recognized all the companies who participated last year and all the companies formed since SVS 2006. The growth was fantastic. Only 15 attended last year compared to the 65 present this year - and they're funded. I know for a fact that at least 5 to 6 of the companies failed to get their information passed along in time to be recognized within the presentation. The SVS concluded with a Space Finance Award Ceremony which I did not attend because I was attending the National Space Society (NSS) dinner planned for the evening.

On the first day of the NSS sessions we began with the plenary session featuring a "local", Kirby Ikin, and Keith Graph. Congressman Lampson's plane was delayed so we started off with a wonderful and informative talk by Johnson Space Center Director Mike Coats. Mr. Coats informed the NSS attendees of lots of Constellation news. Congressman Lampson finally arrived, but he promptly needed to leave as his travel schedule was just as hectic as JSC Director Coats'. The plenary session ended with a wonderful paired report from Shannon Lucid and Donald Petit who both spoke, provided slides, and answered questions. The morning was relatively easygoing. The afternoon sessions were incredible, and I am going to list them here because this is the first ISDC I have attended and I wanted to state for the record that the NSS puts on an impressive and comprehensive conference. Initially, I thought it was too big, but it really offers something for everyone.

The afternoon tracks were:

International Space Station
Space Settlement
Space Business
Frontier Transport
Lunar Frontier

(Continued on page 24)

(Continued from page 23)

- Martian Frontier
- Education 1
- Education 2
- Spaceflight Law & Insurance
- Art & Space Documentary Screenings
- Solar System Frontier & Beyond
- Medicine 1
- Medicine 2
- Lunar Certification Track (Three Hours and all 3 hours are required for Certification)
- Space Outreach (NSS "Town Hall Meeting" with the NSS Board Panel – all Q&A)

Note: the last 4 Tracks were on the last day of the Conference and the Lunar Certification was offered on all 3 days.

In the evenings the activities were organized by the Mars Society of Dallas and the NSS. The activities included a viewing of the movie "Mars Direct" and the NSS movie "Postcards from the Future" which were shown in succession.

The dinners and luncheons all featured well-known personalities, and all of them were wonderful. The first dinner featured science fiction author and Editor Ben Bova. The only words I can come up regarding this gentleman are that if AIAA Houston can schedule Dr. Bova for a major speaking event they should do so. He also has a new book out and the stack he brought with him sold out. [Note: He has a wonderful signature!] He is an exquisite speaker on the subject of the future of space exploration and of the space frontier.

The Gala Dinner featured Dr. Steve Squyres, Principal Scientist for NASA's Mars Exploration Rover Mission. Now, Dr. Steve was fantastic! His delivery for the gala evening was comical, animated, and the PowerPoint presentation as always was full of great reports from our fantastic, far away, Spirit and Opportunity rovers. Mr. Squyres told us of the new findings in recent sols and discussed other scientific and engineering topics in a way in which all in the room could easily comprehend. What I most enjoyed about this presentation was his commendation of everyone on the Mars Team. The interesting observation is not once in his entire review did I recall Dr. Steve enumerating his own accomplishments. It was all about the *gifted others* who did this or that. Now, folks, what does a "true" leader do? The NSS selected Dr. Steven Squyres as the recipient of the 2007 Wernher Von Braun Award; I believe the accomplishments of leading the Mars Exploration Rover Team and his attitude are what brought this award to him. Upon receiving the award he said a few words in praise of NASA, thanking them for the opportunity to participate in this wonderful work, and he again stated he would share the award with his team. He felt they deserved it as much as he did.

The next day Rusty Schweickart, Apollo IX astronaut and Chairman of the B612 Foundation, spoke for the Saturday luncheon about asteroid deflection. *That* opened up a few eyes! Mr. Schweickart spoke sharply and in a clearly informed way on the subject of asteroids. For those who would like to know more about the subject, visit the web site at http://www.b612foundation.org. Mr. Schweickart demonstrated to us the *keyhole effect* that defines where an asteroid is likely to strike and the probability of when it might strike. His presentation was entitled "The Good, the Bad, and the Ugly". His was one of the talks everyone really needs to listen to, but doesn't want to hear. The scary truth is that there are only a small handful of people – according to Mr. Schweickart – who are knowledgeable about this topic and that not enough attention is being given to this potential killer of the human race.

The last speaker on Sunday night was Senator Harrison "Jack" Schmitt at the NSS Awards Dinner. Mr. Schmitt was an Apollo 17 Mission Scientist, so he's no stranger to the space environment. He spoke about Helium 3 (He3) and about reactors we could build to pull energy from He3. It was a fairly technical talk, but he also encouraged folks to write their congressman and let them know about the issues they wanted addressed.

The "bottom lines" for all the speakers present for the luncheons and dinners were varied. Among them they each may have accomplished a great feat, or wrote a fantastic book, or were looking at future colonization, space enterprise, or were supporting a cause for the greater good of mankind. While all of these topics provided food for thought, there was so much to take in, I was *stuffed!*

There was a plethora of vendors and sponsors, and due to the nature of the SVS day there were about 55 areas with displays. The Mars Society of Dallas was out in force as was the NSS, complete with an authors table. Each day of the conference a featured author was present to sign their book [s] for consumers. The Federal Credit Union from NASA Headquarters was on display as a vendor, along with Apogee books, and Space X and their craft was on display. The spirit of flight was not only presented by speakers, it was analyzed, debated, dissected, financially supported, displayed, historically represented, written in books, fictionally described, and featured in movies.

The last activities which were offered on the "flight plan" for the Monday Holiday track on May 28th were as follows:

Space Outreach was a Town Hall Meeting and was open to all for broad Q&A for reflections on the ISDC conference.

Moon Rock Certification Course was a three hour course which certifies folks to teach secondary teachers about how to work with students and about student material and science content regarding moon rocks. The

(Continued on page 25)

(Continued from page 24)
attendee must stay the entire three hours for the certification. This course is taught by Angelo Casaburri.

Space Medicine 2 was a discussion track about civilian space travel and the medial complications or consequences from space tourism.

The last day is always a winddown and I stayed until the end. I walked off the "ship" that I had been on over the past days, onto the empty carpet and looked around. All the draped tables were gone as well as the people and a thought crossed my mind: I wonder how many changes we will make between now and the next year; what will next years' ISDC in Washington, D.C. bring? This conference was such a trip. Once I had arrived and climbed on board, I simply didn't want to leave – it was one heckuva of a ride. The ISDC 2007 was one of the most comprehensive conferences I have attended in a long time and it provided something for everyone involved in space exploration: the scientist, the engineer, the space entrepreneur, and finally the professional speaker/presenter. I think as it matures it may just become the premiere space business event to attend. What is interesting to note is that it's organized by a non-profit organization but it is gaining heavy support from the contractors and now the entrepreneurial organizations and "Angels", too. I think it's interesting there are some major contractors missing from the list of presenting sponsors. Considering the wealth of growth it might be a worth while consideration for other contractor organization to throw their hat in the ring. The presenting sponsors were NASA, Boeing, Wyle Laboratories, Lockheed Martin, Microsoft, Optech, Orion Propulsion, Raytheon, Texas Instruments and Space News. The organizations participating included The Mars Society of Dallas, SEDS, and Red Planet, among others. In the future I imagine seeing the AIAA as a participating organization!

Elon Musk of SpaceX Addresses AIAA Houston

Dinner Lecture Summary

MICHAEL F. LEMBECK, PH.D.

Elon Musk, software developer, pilot, entrepreneur, and now rocket scientist, spoke to a large gathering of AIAA members on May 23rd at the Gilruth Center. Mr. Musk recounted the history of his fledgling rocket company, Space Exploration Technologies, or SpaceX, which he formed in 2002 to reduce the cost of access to space. His design and manufacturing facility in El Segundo, CA is home to approximately 300 employees working on two rockets and a crew and cargo carrying capability he calls "Dragon."

He showed several pictures and short videos of his latest test flight of the Falcon 1 rocket. The second test flight of the Falcon resulted in a successful lift-off and demonstration of first stage capabilities that was marred by an oscillation in the second stage that prematurely terminated the mission. Mr. Musk described some of the improvements being made to the Falcon line to ensure success in future launches.

The audience was most interested in what he had to say about his efforts as one of two initial companies that won a NASA Commercial Orbital Transportation Services Contract (COTS). He illustrated the progress at SpaceX with pictures of the "Dragon" spacecraft test article currently under development. "Dragon" can support up to 2500 kg of cargo or seven crew members and lands in the water under a set of parachutes. He hopes to launch "Dragon" on his second launch vehicle, the Falcon 9, late next year.

A recording of the lecture was made with the kind assistance of JSC, and the one hour video has been posted publicly at www.nasaspaceflight.com. See the AIAA Houston web site front page for the link.

Above: Elon Musk, SpaceX CEO, speaks to a large audience at Gilruth on May 23rd.
Below: Dr. Michael Lembeck (left) and Horizons Editor Jon Berndt (far left) converse with Elon Musk (right) prior to Mr. Musk's lecture.

CALENDAR

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

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

September

10 Executive Council Meeting
Location: Northrop Grumman Integrated Systems, 16055 Space Center Blvd., Suite 200
Time: 5:30-6:30pm
Contact chair@aiaa-houston.org or 281-244-3925 if you are interested in volunteering.

21 Workshop on Automation & Robotics (WAR) and INNOVATION at NASA/JSC Gilruth Center, 9:00 am to 5:00 pm. WAR is a free morning workshop organized by AIAA Houston Section's Automation & Robotics technical committee. Contact the committee's Chair, Dr. Zafar Taqvi, 281-244-4436 (Zafar.S.Taqvi@boeing.com)
INNOVATION is a workshop ($5.00 registration) organized by the Clear Lake Council of Technical Societies (CLCTS). Contact Chuck Dusold at 281-244-4526 (Charles.G.Dusold@boeing.com) or Rita Dawson at Rita.J.Dawson@boeing.com. Luncheon-only registration cost is $7.50. Full-day registration cost for both annual events (luncheon included) is $12.00.

29 Lunch & Learn: Wernher von Braun's Long Road to Mars: A Story Within a Story
(Sponsored by the Astrodynamics Technical Committee)
Location: TBD
Time: TBD
Speaker: Dr. A. A. Jackson, Chair, AIAA Houston Astrodynamics Technical Committee

October

1 Executive Council Meeting
Location: Northrop Grumman Integrated Systems, 16055 Space Center Blvd., Suite 200
Time: 5:30-6:30pm
Contact chair@aiaa-houston.org or 281-244-3925 if you are interested in volunteering.

3 Lunch & Learn: 50th Anniversary of Sputnik
(Sponsored by the Astrodynamics Technical Committee)
Location: TBD
Time: TBD
Speaker: James Oberg, author, journalist, and former human space program engineer (www.jamesoberg.com)

11-12 Houston System of Systems Seminar, at NASA/JSC Gilruth Center, 8:00 am to 5:00 pm both days. This unique seminar is organized by the Clear Lake Council of Technical Societies (CLCTS). Plans include experts from the United States of America and abroad speaking on system of system topics such as aeronautics, unmanned aerial vehicle (UAV), weather, transportation, space communication, emergency disaster rescue, satellite, battle space, and enterprise. Contact Dr. Zafar Taqvi, 281-244-4436 (Zafar.S.Taqvi@boeing.com).

November

2 Lunch & Learn: Apollo 13 Trajectory Reconstruction.
(Sponsored by the Astrodynamics Technical Committee)
Location: TBD
Time: TBD
Speaker: Daniel R. Adamo

December

7 Lunch & Learn: Title is TBD
(Sponsored by the Astrodynamics Technical Committee)
Location: TBD
Time: TBD
Speaker: Marianne Dyson, author and former NASA flight controller (www.mariannedyson.com)

Cranium Cruncher

BILL MILLER, SENIOR MEMBER

The following word search contains the last names of all ISS crews from Expedition 1 through Expedition 16 and also for STS-118 (see list at right).

M K O T O V O N U Z R O K Y T E S E D N
O O K K A L E R I Z T Y L Y H K H Y I C
A I R G E L A Z E P O L U G C C U H Z U
S K H G E N N E C A E R U A R N K A L L
B H L C A M O V Y K I A L C U I O R A B
O O A A C N Q S Y N B D H S H F R T W E
W K F R D A P A R O W E C C T I M S R R
E N O O I A R R H E L M R S R G A E E T
R E A K C P P T L M D U X S A I I O V S
S Z L N U K O L S U Y N D H C S N E Z O
O D E E Z M Q V O A S T A R M X L A S N
X I W H I T S O N N M T S A E A Z S T S
D G E C R E T I E R U U N W K H O E Y T
F O G N V E R A K O T F I I O V P P R E
L L P E P B J V I N O G R A D O V E A H
P H I L L I P S Y H E K A I F V S T H C
N Y D A P G Q A E Z E M D P E C J T J S
D M S M A I L L I W L Z U Y H N E I L R
V O R U H Z E D W E R D B E B P K T V U
V U S A C H E V D Y H F V E R V R O O B

ANDERSON
BOWERSOX
BUDARIN
BURSCH
CALDWELL
CHIAO
CULBERTSON
DEZHUROV
DREW
EYHARTS
FINCKE
FOALE
GIDZENKO
HELMS
HOBAUGH
KALERI
KELLY
KORZUN
KOTOV
KRIKALEV
LOPEZALEGRIA
MALENCHENKO
MASTRACCHIO
MCARTHUR
MORGAN
ONUFRIENKO
PADALKA
PETTIT
PHILLIPS
REISMAN
REITER
SHARIPOV
SHEPHERD
SHUKOR
TANI
TOKAREV
TRESCHEV
TYURIN
USACHEV
VINOGRADOV
VOSS
WALZ
WHITSON
WILLIAMS
YURCHIKHIN

Current Cruncher for this issue

Scientist-astronauts based at the Moon's south pole have bored a straight shaft from this point to the Moon's north pole. The shaft has been lined with unobtainium (a mass-less, infinitely strong, and frictionless material) to keep it from closing up. The researchers plan to drop a sensor package into the shaft with zero initial velocity. Assuming a non-rotating Moon of uniform density with a perfect vacuum in the shaft, what will happen to the package, and how long will it take?

After the sensor package was launched, it was discovered that a serious error had been made in the alignment of the shaft. Although the shaft was indeed constructed in a perfectly straight line, it had been bored at an angle such that instead of exiting at the Moon's north pole, the exit point is at the Moon's equator. What effect does this error have on the timing of the sensor package's motion?

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.

The image below was taken by the Editor using a $5 telescope (on clearance from a local pharmacy) with a handheld digital camera looking into the eyepiece.

Odds and Ends

SPECIAL EVENTS, PICTORIALS, ETC.

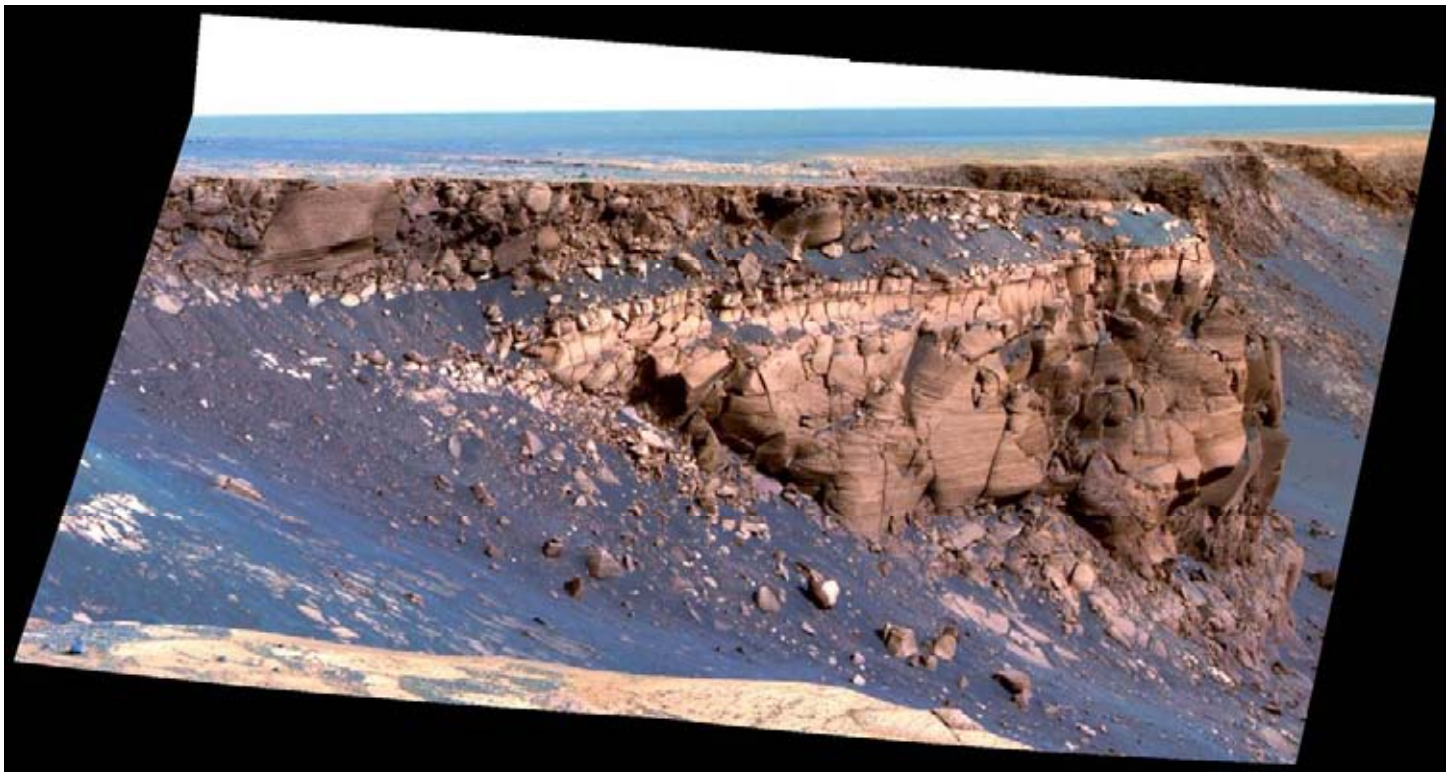
Above: Sunset over North Carolina, taken from the pilot's seat in a Piper PA-46 Malibu Mirage. [Photograph © by Alex McMahon, July 2007. Used with permission. Photo via airliners.net]

Right: X-48B Blended Wing Body Research Aircraft Makes First Flight [Photo courtesy of NASA Dryden Flight Research Center]

The collaborative efforts of the Boeing Co. of Chicago, Ill., NASA's Fundamental Aeronautics Program, and the Air Force Research Laboratory at Wright Patterson Air Force Base, Ohio culminated on the first flight of the X-48B Blended Wing Body research aircraft on July 20, 2007. The experienced flight research team kept a watchful eye as the 21-foot wingspan, 500-pound, remotely piloted test vehicle took off for the first time at 8:42 a.m. PDT and climbed to an altitude of 7,500 feet before landing 31 minutes later.

Above: Oasis Hong Kong Boeing 747-400 flies over England. [Photograph © by Rainer Bexten, May 2007. Used with permission. Photo via airliners.net]

Below: This NASA/JPL/Cornell false-color image from the Mars Exploration Rover Opportunity shows a portion of the rock wall inside Victoria Crater. If Opportunity survives the current dust storm, it will likely descend into the crater at some point. Photo is from May, 2007.



Conference Presentations/Articles by Houston Section Members

COMPILED BY THE EDITOR FROM AIAA AGENDAS, SUBMISSIONS, ETC.

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

AIAA Guidance, Navigation and Control Conference
AIAA Atmospheric Flight Mechanics Conference
AIAA Modeling and Simulation Technologies Conference
20 - 23 Aug 2007
Marriott Hilton Head Beach and Golf Resort
Hilton Head, South Carolina

Design of a Morphing Wing : Modeling and Experiments
M. Majji, O. Rediniotis and J. Junkins, Texas A&M University, College Station, TX

Aerospace Vehicle Motion Emulation Using Omni- directional Mobile Platform
J. Davis, J. Doebbler, J. Junkins and J. Valasek, Texas A&M University, College Station, TX

Mars Science Laboratory Entry Optimization Using Particle Swarm Methodology
M. Grant and G. Mendeck, NASA Johnson Space Center, Houston, TX

Analytic Skip Entry Guidance
E. Garcia-LLama, , Houston, TX

Total Least Squares Estimation of Dynamical Systems
M. Majji and J. Junkins, Texas A&M University, College Station, TX

Comparison of Three Orion Skip Entry Guidance Algorithms and Performance
J. Rea, NASA Johnson Space Center, Houston, TX; A. Barth, Lockheed Martin Corporation, Houston, TX; and G. Barton, Charles Stark Draper Laboratory, Inc., Cambridge, MA

Orion Entry, Descent and Landing Simulation
B. Hoelscher, NASA Johnson Space Center, Houston, TX

Orion FCS Design, Stability and Performance Issues
A. Strahan, NASA Johnson Space Center, Houston, TX; G. Loe, Honeywell, Houston, TX

Orion Entry, Descent & Landing Performance and Mission Design
J. Broome and W. Johnson, NASA Johnson Space Center, Houston, TX

Spacecraft Momentum Management and Attitude Control Using a Receding Horizon Approach
J. Fisher, R. Bhattacharya and S. Vadali, Texas A&M University, College Station, TX

Prediction of Icing Effects on the Coupled Dynamic Response of Light Airplanes
A. Lampton and J. Valasek, Texas A&M University, College Station, TX

Target Maneuver Detection
V. Lam and D. Quam, Lockheed Martin, Grand Prairie, TX

Neural Dynamic Trajectory Design and Trajectory Guidance for Reentry Vehicle
A. Verma, P. Xu, K. Vadakkeveedu and R. Mayer, Knowledge Based Systems Inc., College Station, TX; M. Oppenheimer and D. Doman, AFRL/VACA, WPAFB, OH

Decentralized Cooperative- Control Design for Multi- Vehicle Formations
L. Weitz and J. Hurtado, Texas A&M University, College Station, TX; A. Sinclair, Auburn University, Auburn, AL

Crew Exploration Vehicle Ascent Abort Overview
J. Davidson and D. Sparks, NASA Langley Research Center, Hampton, VA; J. Madsen and R. Proud, NASA Johnson Space Center, Houston, TX; D. Raney, NASA Langley Research Center, Hampton, VA; P. Kenyon, Lockheed-Martin, Denver, CO

Crew Exploration Vehicle Service Module Ascent Abort Coverage
M. Tedesco and B. Evans, NASA Johnson Space Center, Houston, TX; R. Falck, NASA Glenn Research Center, Cleveland, OH; D. Merritt, NASA Johnson Space Center, Houston, TX

Automated and Manual Commanding Concepts for Orion Ascent Guidance, Navigation, and Control
J. Hart and A. Wells, NASA Johnson Space Center, Houston, TX; P. Miotto and M. Cleary, The Charles Stark Draper Laboratory Inc., Cambridge, MA; R. Proud, NASA Johnson Space Center, Houston, TX; D. Zimpfer, The Charles Stark Draper Laboratory Inc., Cambridge, MA

Multi-Layer Approach for Motion Planning in Obstacle Rich Environments
S. Kim and R. Bhattacharya, Texas A&M Univ., College Station, TX

Near Optimal Trajectory Generation for Omnidirectional Vehicles by Constrained Dynamic Inversion
A. Shekhawat, T. Kalmar-Nagy and J. Valasek, Texas A&M University, College Station, TX; J. Turi, University of Texas at Dallas, Dallas, TX

Centralized and Distributed Path Planning for Multi- Agent Exploration
G. Giardini, Politecnico di Milano, Milano, Italy; T. Kalmar-Nagy, Texas A&M University, College Station, TX

An Orion/Ares Launch and Ascent Simulation - One Segment of the Distributed Space Exploration Simulation (DSES)
E. Crues, NASA Johnson Space Center, Houston, TX; V. Chung, NASA Langley Research Center, Hampton, VA; M. Blum, NASA Ames Research Center, Moffett Field, CA; J. Bowman, Teledyne Brown Engineering, Huntsville, AL

Sonic Boom Assessment for the Crew Exploration Vehicle
M. Herron, NASA, Houston, TX

Orion GN&C Overview and Architecture
H. Hu, NASA, Houston, TX; R. Chambers, Lockheed Martin, Denver, CO

NASA ANTARES Simulation GNC Architecture
R. Gay, NASA, Houston, TX; M. Jackson, Draper Laboratory, Houston, TX

(Continued on page 31)

(Continued from page 30)

Orion Mission Design and Analysis
J. Condon, NASA, Houston, TX; B. Buches, Lockheed Martin, Denver, CO

Orion Deep Space and Cislunar Guidance and Navigation
T. Crain and C. D' Souza, NASA, Houston, TX

Challenges of Orion Rendezvous Development
J. Goodman, United Space Alliance, Houston, TX; J. Brazzel, NASA, Houston, TX; D. Chart, Lockheed Martin, Denver, CO

Orion Rendezvous, Proximity Operations and Docking Design and Analysis
C. D' Souza, C. Hannak and P. Spehar, NASA, Houston, TX; F. Clark and M. Jackson, Draper Laboratory, Houston, TX

Orion Orbit Control Design and Analysis
R. Gonzalez, NASA, Houston, TX; M. Jackson, Draper Laboratory, Houston, TX; C. Sims, Lockheed Martin, Houston, TX

TDRSS Augmentation for Launch and Ascent High Speed Navigation Filter
G. Holt, NASA / Johnson Space Center, Houston, TX

A General Solution to the Aircraft Trim Problem
A. De Marco, University of Naples Federico II, Naples, Italy; E. Duke, Rain Mountain Systems Incorporated, Glasgow, VA; and J. Berndt, JSBSim Development Coordinator, Houston, TX

Zero Prop Maneuver Space Station Demonstration
N. Bedrossian and S. Bhatt, The Charles Stark Draper Laboratory, Houston, TX; M. Lammers and L. Nguyen, NASA Johnson Space Center, Houston, TX; Y. Zhang, Rice University, Houston, TX

Near Time- Optimal Waypoint Tracking Algorithm for a 3- DOF Model Helicopter
B. Singh and R. Bhattacharya, Aerospace Engineering Texas A&M University, College Station, TX

Hierarchical Multi- Rate Measurement Fusion in Estimation of Dynamical Systems
M. Majji, J. Davis and J. Junkins, Texas A&M University, College Station, TX

Fault Tolerant Relative Navigation Using Inertial and Relative Sensors
G. Hoffmann, Stanford University and Mitek Analytics LLC, Stanford, CA; D. Gorinevsky, Stanford University and Mitek Analytics LLC, Stanford, CA; R. Mah, NASA Ames Research Center, Moffett Field, CA; C. Tomlin, Stanford University, Stanford, CA; J. Mitchell, NASA Johnson Space Center, Houston, TX

Multi- Spacecraft Formation Maneuvering for Optimal Interferometric Image Acquisition: Necessary Conditions for Optimality
H. Altwaijry, King Abdulaziz City for Science and Technology, Riyadh, Saudi Arabia; D. Hyland, Texas A&M University, College Station, TX

Structured Adaptive Model Inversion Controller for Mars Atmospheric Flight
C. Restrepo and J. Valasek, Texas A&M University, College Station, TX

Simulation for Multiple User Communities and Facilities
A. Acevedo, J. Arnold, J. Berndt, W. Othon and R. Gay, NASA JSC Engineering, Houston, TX

AIAA SPACE 2007 Conference & Exposition
18 - 20 Sep 2007
Long Beach Convention Center
Long Beach, California

Radiation Environments for Deep- Space Missions and Exposure Estimates
W. Atwell, The Boeing Company, Houston, TX

Solar Proton Event Planning for Lunar and Mars Human Missions
J. Kunches, NOAA Space Environment Center, Boulder, CO; W. Atwell, The Boeing Company, Houston, TX

Robotic Assist for Lunar Surface Operations
K. Peek, United Space Alliance, Houston, TX

Astrotech Research & Conventional Technology Utilization Spacecraft (ARCTUS) Description and CONOPS
B. Kutter, F. Zegler and M. Foster, United Launch Alliance, Denver, CO; M. Johnson and R. Fitts, SPACEHAB, Houston, TX

An Immersive Training and Mission Integration Tool to Facilitate Long Duration Space Exploration Missions
L. Roche, United Space Alliance, Houston, TX

Spectral Characterization of Secondary Radiation from Regolith Materials
S. Aghara, E. Wright, R. Wilkins, J. Zhou and B. Gersey, Prairie View A&M University, Prairie View, TX

Radiation Environment Particle Flux: Assessment with MARIE Data
E. Towns, Prairie View A&M University, Prairie View, TX; P. Saganti, NASA-Center for Applied Radiation Research Prarie View A&M University, Prarie View, TX

Radiation Particle Flux Assessment: ACE/CRIS Data
T. Calvin, Prairie View A&M University, Prairie View, TX; P. Saganti, NASA-Center for Applied Radiation Research Prairie View A&M University, Prarie View, TX

Approach to protecting CEV/Orion from Micro- Meteoroid Orbital Debris (MMOD)
E. Christiansen, NASA Johnson Space Center, Houston, TX; W. Bohl, Lockheed Martin, Denver, CO; W. Jermstad, NASA Johnson Space Center, Houston, TX

Commonality: A Key to Affordable Mission Success
R. Vogtman, United Space Alliance LLC, Houston , TX; K. Romano, Embry Riddle Aeronautical University, Houston , TX; L. Zook, United Space Alliance LLC, Houston, TX

Oral Presentation: Future Space Leaders: From Legacy Programs to My Future in the Exploration Vision
A. Leung and J. Ceballos, Boeing, Houston, TX; C. Harrison, The University of Texas at Arlington (UTA) / Boeing, Arlington, TX

A Piloted Orion Flight to a Near- Earth Object: A Feasibility Study

(Continued on page 32)

AAAF and AIAA Sign Cooperative Agreement

AIAA

July 2, 2007 – Reston, Va. – The Association Aéronautique et Astronautique de France (AAAF) and the American Institute of Aeronautics and Astronautics (AIAA) signed a Memorandum of Understanding June 21 in conjunction with the Paris Air Show.

Vincent Boles, AIAA vice president international, stated, "As the aerospace marketplace evolves, international collaboration is of ever greater importance. Although we compete in some areas, we also can accomplish much more by collaboration in areas such as space exploration, air traffic systems, and global change assessment."

The MOU calls for cooperation and collaboration in information exchange, organization and hosting of conferences and workshops, participation in student events, and addressing other topics of mutual interest.

AAAF President Dr. Michel Scheller and Boles, representing AIAA President Dr. Paul Nielsen, were present at the signing, which was followed by a brief reception at the AAAF display booth at Le Bourget.

A joint activity planned prior to signing the MOU was the co-organization of the Aircraft Noise and Emissions Reduction Symposium, held June 25-27 in La Baule, France.

The MOU with AAAF is part of AIAA's expanded focus on global outreach and international collaboration.

AIAA advances the state of aerospace science, engineering, and technological leadership. Headquartered in suburban Washington, D.C., the Institute serves over 35,000 members in 65 regional sections and 79 countries. AIAA membership is drawn from all levels of industry, academia, private research organizations, and government. For more information, visit www.aiaa.org.

Conference Presentations/Articles by Houston Section Members

(Cont'd.)

(Upcoming Conference Presentations, Continued from page 31)
R. Landis, NASA Johnson Space Center, Houston, TX; D. Korsmeyer, NASA Ames Research Center, Moffett Field, CA; P. Abell, NASA Johnson Space Center, Houston, TX; R. Gershman and T. Sweetser, NASA Jet Propulsion Laboratory, Pasadena, CA; D. Adamo, Consultant, Houston, TX

Advanced Space Systems Concepts and Opertaions in Support of Space Exploration
S. Mackwell, Universities Space Research Association, Houston, TX

Design and Testing of a Small- Scale, Reusable Reactor for Hydrogen Reduction of Lunar Soils
A. Paz, C. Howard and T. Simon, NASA - Johnson Space Center, Houston, TX; J. Holladay, Batelle/Pacific Northwest National Laboratory, Richland, WA; C. Chang, NASA - Johnson Space Center, Houston, TX; J. Hu, Batelle/Pacific Northwest National Laboratory, Richland, WA

VASIMR: A Private Enterprise Solution to Space Transportation Beyond LEO
E. Bering, Physics Department University of Houston, Houston, TX; T. Glover, F. Chang-Diaz, J. Squire and L. Cassady, Ad Astra Rocket Company, Houston, TX; M. Brukardt, Physics Department University of Houston, Houston, TX

Sustainability, Strategic Communications, and Relevance: Why YouTube Won't Get Us to Mars
M. L. Dittmar, Dittmar Associates, Inc., Houston, TX

NASA's Value to the Nation: 50 Years of Lessons
M. K. Craig, Science Applications International Corporation (SAIC), Houston, TX

Lunar Habitation Strategies
K. Kennedy and L. Toups, NASA-JSC, Houston, TX; D. Smitherman, NASA-MSFC, Hunteville, AL

Development Life of the ISS On Orbit Replaceable Unit Temp Stow Device
Z. Ney and C. Looper, United Space Alliance, Friendswood , TX

Tolerances Associated with Precision Internal Mechanical Parts of a Space Suit
Z. Ney, R. Lottridge and C. Looper, United Space Alliance, Friendswood, TX

A Review of the Approach to ISS Increment Crew EVA Training
E. Bell, United Space Alliance, Houston, TX; D. Coan, Barrios Technology, Houston, TX

Symbiotic Operations
C. Leslie, G. Miller, P. Kent and D. Dannemiller, United Space Alliance, Houston, TX

Commercial Development Strategy of the NASA Exploration Systems Mission Directorate
K. Davidian and N. Woodward, NASA Headquarters, Washington, DC; D. Rasky and G. Schmidt, NASA Ames Research Center, Moffett Field, CA; R. Kelso and D. Stone, NASA Johnson Space Center, Houston, TX

Avionics Mission Cycles for Constellation
G. O'Neil, United Space Alliance LLC, Houston, TX

A Philosophy of EVA Flight Control and Training for Lunar and Martian Expeditions
E. Bell, United Space Alliance, Houston, TX; D. Coan, Barrios Technology, Houston, TX

Designing a Long Duration Martian Exploration Vehicle: A Solar System Longboat
D. Barker, Mars Advanced Exploration and Development Inc., Houston, TX

AIAA Section News

AIAA Monthly Meetings are Open

New faces are welcome at our monthly AIAA Houston section executive council meetings. Please review our web site and the org chart at www.aiaa-houston.org before attending, if possible. AIAA membership is not required, though we will be working with you to find a role in our volunteer work. To ensure proper room size and no late changes in time and location, please contact someone from the list below before attending.

Location:
Northrop Grumman Integrated Systems,
16055 Space Center Blvd., Suite 200,
Houston

Contact List:
Douglas Yazell 281-244-3925
Jayant Ramakrishnan 281-461-9797
Chad Brinkley 281-226-5100
Tim Propp 281-226-4692

Seeking Volunteers

The Houston Section is seeking volunteers interested in participating in the following areas:

College and Co-op outreach
Membership
Professional Development
E-Mail Communications
Councilors (3)
International Space Activities Committee Student Paper Conference

Opportunity for community service, personal & leadership development, networking, etc. Contact chair@aiaa-houston.org

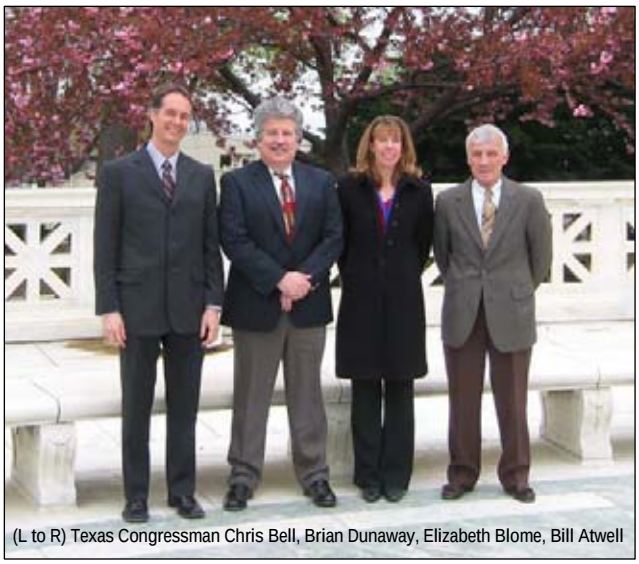
2007-2008 "Spirit of Apollo" College Scholarship Award

Kristen John was awarded the Houston Section "Spirit of Apollo" Scholarship of $1000 for the 2007-2008 academic year. Kristen is from The Woodlands, Texas, and will start her senior year in the fall as an Aerospace Engineering student at the University of Texas in Austin. Kristen was competitively selected by the scholarship committee from the applications received this year from students at various Texas Colleges. She was highly recommended for the scholarship by her UT aerospace engineering professor and research advisor, Dr. Hans Marks, who was a former Secretary of the Air Force.

Ms. John has a very impressive undergraduate résumé. Along with maintaining a high GPA, she has excelled in many extra-curricular activities including: peer mentor for First Year Group freshman engineering students, undergraduate research assistant on electromagnetic rail guns, flew in the NASA Reduced Gravity Student Flight Opportunities Program, received 3rd place for Oral Presentation and Best use of Graphical Models in the Texas Space Grant Consortium Design Challenge, and currently is on the Cessna/ONR "Design, Build, Fly" student competition team. Kirsten worked as a Co-op student on the Space Shuttle Program with the Systems Engineering and Integration team at United Space Alliance for eight months in 2006, and this summer is working as an intern at NASA Ames.

The "Spirit of Apollo" Scholarship honors the historic accomplishments of the Apollo Space Program by encouraging outstanding students at Texas Colleges to continue their studies in engineering, math or science. Qualified applicants must have completed their freshman academic year with a GPA of at least 3.0 on a 4.0 scale. The qualified applicants must provide an essay, three letters of recommendation, college transcripts, along with a description of extracurricular activities and work experience. Additional information and the application form for our annual scholarship can be found on the Houston Section's webpage.

Congratulations to Kristen John as our scholarship winner, and to all this year's applicants for their distinctive academic accomplishments in the engineering and science fields!


(L to R) Texas Congressman Chris Bell, Brian Dunaway, Elizabeth Blome, Bill Atwell

Congressional Visits Day 2007

On April 18th, 3 members of the AIAA -Houston section: Bill Atwell, Elizabeth Blome, and Brian Dunaway, traveled to Washington D.C. for Congressional Visits Day. We also had Daniel Clancy, from the AIAA-Dallas section join us for many of our appointments. We had a great day full of appointments due to the fantastic work of Bill Atwell and AIAA-Houston section member Wayne Rast prior to our departure.

We met with staff members representing the Texas Senators, some of the Texas Representatives, and the Senate Science committee.

Throughout the day we delivered a consistent message:

NASA's budget woes will significantly impact CEV delivery and scientific research. The lack of budget for research in particular is causing a loss of the "brain trust" from academia, industry, and government agencies that may be impossible to recover from.

U.S. is lagging behind China and India in regards to engineering and science education.

Overall, our message was well received. Many of the offices seemed very familiar with our talking points and appeared to be more knowledgeable with the challenges NASA is facing than they have in past years. As a 3 year veteran of Congressional Visits Day, I was pleased to see that our visits are making a difference.

I encourage anyone who is interested in participating in Congressional Visits Day 2008 to notify the AIAA-Houston section officers. It is a wonderful opportunity to see our Representatives at work and show them how much their support is needed. AIAA also offers $500 scholarships to help defray expenses!

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

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AIAA Mission & Vision Statement

The shaping, dynamic force in aerospace - THE forum for innovation, excellence and global leadership. AIAA advances the state of aerospace science, engineering, and technological leadership. Core missions include communications and advocacy, products and programs, membership value, and market and workforce development.

The World's Forum for Aerospace Leadership

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.