Horizons

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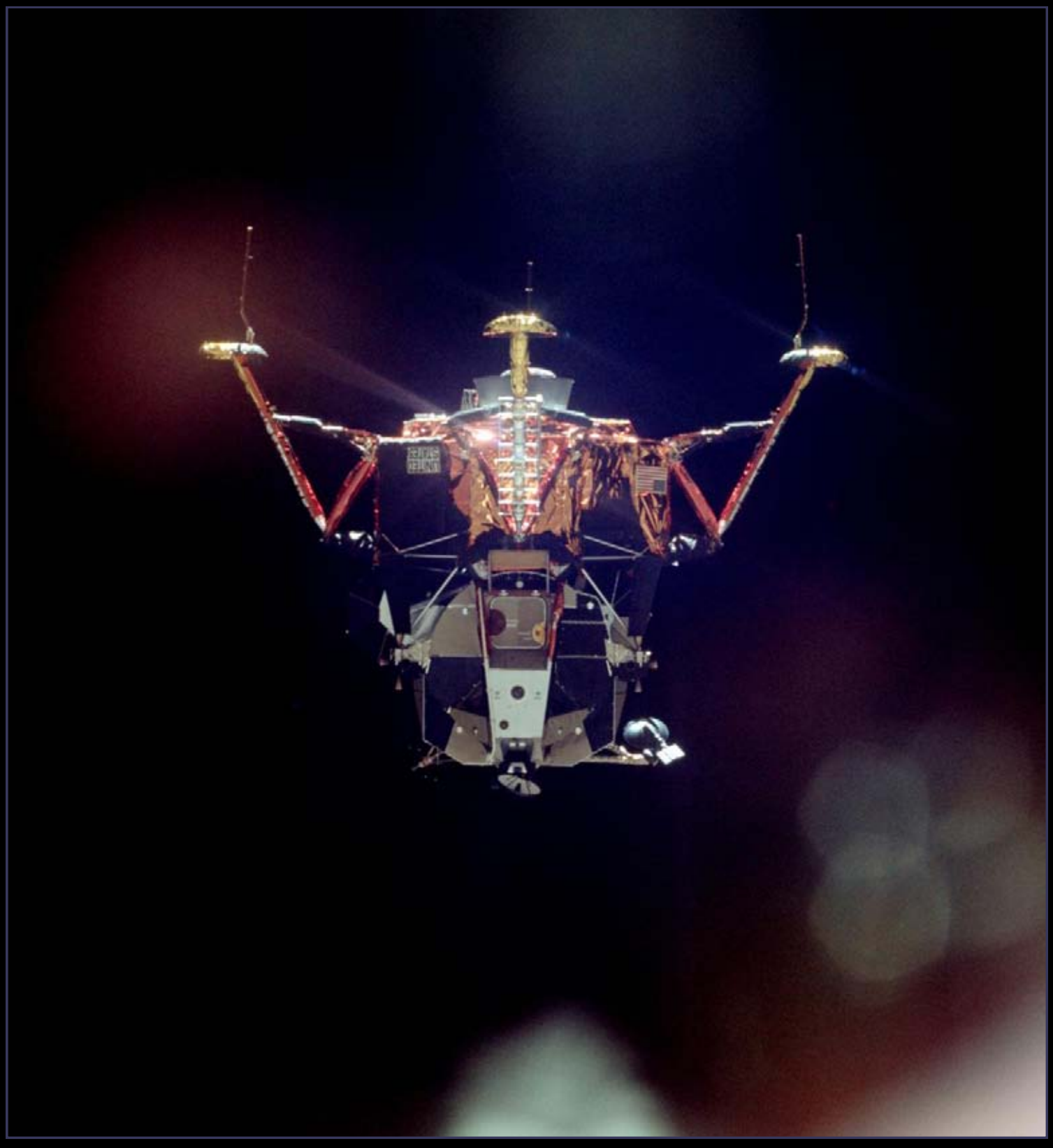

Summer 2009

AIAA HOUSTON
American Institute of Aeronautics and Astronautics

Horizons is a quarterly publication of the Houston section of the American Institute of Aeronautics and Astronautics.

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Cover: (NASA photograph) Apollo 11 astronaut Michael Collins photographed the Lunar Module *Eagle* during a pre-landing inspection, 40 years ago this month.

Our Professional Duty

From the Editor

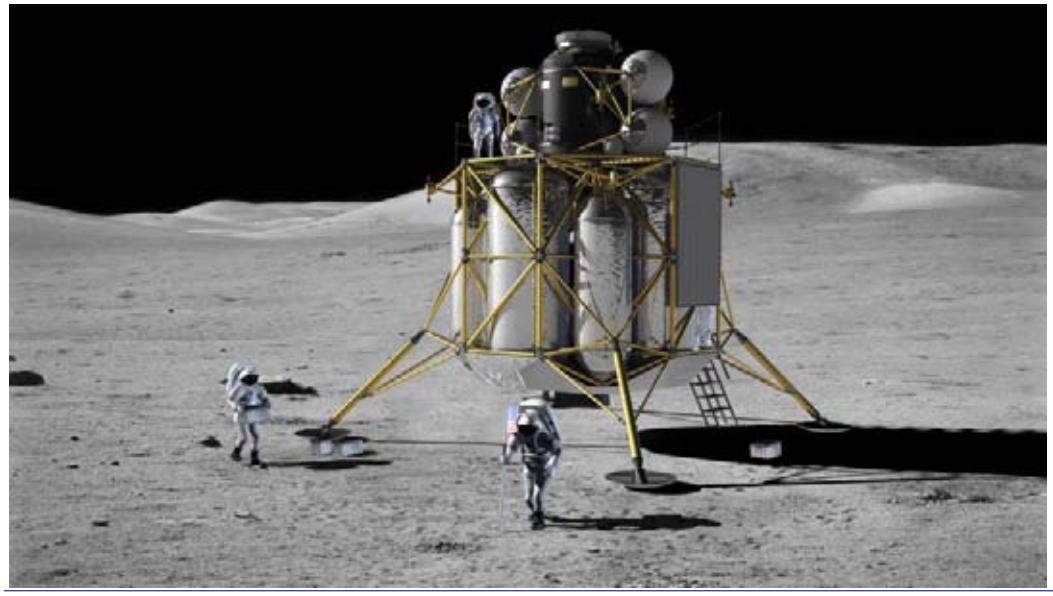
Featured in this issue are a few of the more controversial topics that our section has addressed in some time. We get an update of the latest version of DIRECT in an interview with Ross Tierney, who originally conceived of this architecture, a "re-imagined" version of the National Launch System (NLS) system from 1991, and was its original public face when it was published in October 2006. The system continues to generate some vigorous dialogue, both on the local level within our professional society and more publicly, as version 3.0 has been released on the heels of its rebuttal of NASA's review of version 2.0.

Also in this issue is a report of a Lunch and Learn in which Daniel Adamo, former JSC Flight Dynamics Officer, expanded on his Annual Technical Symposium (ATS) presentation proposing yet another alternate to the Constellation architecture. His approach includes a "Lunar surface rendezvous" (LSR), which trades the challenges of an Apollo-style "Lunar orbit rendezvous" (LOR) for the unknown complexity of a precision landing and surface refueling and resupply. In return, he claims, an increased ability to "land anywhere and leave anytime" is obtained. His presentation generated some debate, both at the conference and after his subsequent seminar, as to its feasibility.

Ironically, the analogues to the DIRECT and LSR approaches in the initial stages of Apollo were ranked as less desirable than the LOR approach eventually successfully executed during that program. Additional proposals for alternate access to space with varying degrees of viability also include a man-rated Delta IV, various Commercial Orbital Transfer Services (COTS) projects, or even a shuttle-derived vehicle. The feasibility of any of these ideas has yet to be shown.

However, an ongoing discussion of the relative merits of these and other potential alternates to Constellation is a healthy trend for our profession. Indeed, in the June issue of Aerospace America, editor Elaine Camhi posed some rhetorical questions, asking whether the current approach to achieving the Vision for Space Exploration is the appropriate one. We owe it to ourselves and the general public to have an honest discussion of the technical merits of any idea on the table, above and beyond loyalty to a given company, agency, or program. We are to "remove our corporate hats," as Wayne Rast advised during the ATS when describing our inputs to the decision making in Congress. I am proud to have been witness to some intense but civil discussions, and hope that they can continue.

Incidentally, details concerning these ideas (and probably a multitude of others) have been made available to the recently convened Augustine commission for their review. They have also established a website through which anyone can pose suggestions, comments or questions at http://www.nasa.gov/



Left: Artist concept of the Altair Lunar lander, courtesy of NASA.

Event

Astronaut Garrett Reisman Talks About Life Onboard the ISS During Expedition 16/17

ALAN SIMON, ASSISTANT EDITOR

Above: Garrett Reisman crew photo

Astronaut Garrett Reisman (ISS Expedition Missions 16/17) shared his fascinating personal perspectives about flying onboard the space shuttle and spending three months aboard the International Space Station (ISS) during an exceptional presentation at Clear Lake's Congregation Shaar Hashalom on January 11, 2009. He also focused on the influence that his Jewish heritage has had on his life and career. Roger Weisman, a local space enthusiast, coordinated the presentation.

Dr. Reisman began with a short video of his flight aboard the now 10-year old ISS and followed with a series of still imagery. Though Reisman stayed busy with important work during his three-month stay, he did have a few opportunities to do some fun activities. And those were the activities highlighted for the engaged audience. Perhaps never before has juggling been as intriguing as when demonstrated using a flashlight, plastic pirate sword, and a stowage bag. Reisman also showed off his many acrobatic feats, sometimes with background music from *2001: A Space Odyssey*. Additionally, he proved his skills performing a host of eating and drinking tricks that included gummy fish and water blobs.

Reisman's expectations were far exceeded in every way during his voyage. He flew with 19 different crewmembers, including astronauts and cosmonauts, and developed some strong bonds with these individuals. He launched on STS-123 in March 2008 and was a member of both the Expedition 16 and 17 crews. He returned home in June 2008 as a member of the STS-124 crew.

Reisman was the first Jewish crew member on the International Space Station. And as Israel celebrated its 60th Independence Day in May 2008, he sent a greeting to the people of Israel. "Every time the Station flies over the State of Israel, I try to find a window, and it never fails to move me when I see the familiar outline of Israel coming toward us from over the horizon," he said.

Dr. Reisman's primary responsibilities were the installation of the Japanese module (which was so large, it had to be carried up in three separate pieces) and assembly of the Canadian built robot called Dextre. Dextre resembles a headless torso, fitted with two extremely agile 3-meter-long arms. The 3.5-meter-long body pivots at the "waist." The body has a grapple fixture at one end that can be grasped by the larger Space Station Arm, Canadarm2 so that Dextre can be positioned at the various worksites around the Space Station. The other end of the body has an end effector virtually identical to that of Canadarm2, so that the Dextre can be stored on Space Station grapple fixtures, or it can be used as an extension to the larger arm. Reisman claimed he secretly worried that Dextre might go berserk, and he would not know what to do. Fortunately for Reisman, Dextre does not have a brain, and someone like Reisman is required to operate the robot.

One day during his stay onboard the station, he and his crewmates attempted mutiny from Mission Control. They had formulated three simple demands: they required an adjustment in their flight profile that would put them in an east-to-west trajectory; they required a hot tub; and finally, they demanded pizza. Fortunately for Mission Control, these

Upper right: Dextre, the two-armed Canadian-built manipulator, assembled by Reisman
Below: Israel as seen from orbit

demands were coincident with All Fool's Day.

During the 95-day period while Reisman worked on the Space Station, various spacecraft docked and undocked from his temporary home nine times. So, his tour was quite busy with many people coming and going. One of these visiting craft was the Jules Verne Automated Transfer Vehicle (ATV), which flew selected notes from the French author and science fiction pioneer.

Reisman explained that while performing science initiatives onboard, sometimes he conducted experiments, and sometimes he was the experiment. Health maintenance is a particular goal for long duration missions, and currently proper health can only be maintained for about six months. Obviously, a mission to Mars that would take at least two years is not feasible until more research can be performed and data analyzed. Body mass is measured on-orbit, not by a bathroom scale, but by a device that measures vibrational frequency, whereby mass or weight can be inferred. To stay healthy, maintain bone mass, and keep his muscles tone, Reisman completed a 2-hour exercise regimen everyday, alternating between a treadmill, resistance devices, and a stationary bicycle.

Interestingly, Reisman was wearing a LiveStrong yellow bracelet during an interview with TV personality Stephen Colbert. After returning from space, Reisman appeared as a featured guest and presented the same bracelet to Colbert in person.

Dr. Reisman shared some Earth photos that had significant meaning to him. He particularly liked the Eiffel Tower in Paris; the New York Yankee Stadium, with which he has a childhood connection; San Francisco Bay, which was absolutely amazing; and Los Angeles, of which he showed an impressive shot. From almost 200 miles up, Reisman said that the sky and oceans no longer seemed as vast as he once thought. Just before a sunrise, or as the sun would set, he commented that the Earth's atmosphere was finally observable as it really is—just a tiny sliver.

Interestingly, Greg Chamitoff was Reisman's replacement onboard the International Space Station. Reisman explained that Chamitoff brought up bagels for him. He joked that, even though the Russians found out about the bagels and the Jewish heritage shared between Reisman and Chamitoff, a pogrom was averted! Reisman also quipped about the scrutiny he endured before he was allowed to fly a Mezuzah that he placed above his sleep station during his stay. (A Mezuzah is a small, decorative case that encloses a piece of parchment or paper, inscribed with Hebrew verses.)

Upon his return to Earth after more than three months aloft, his adaptation to gravity required only several days, better than most, possibly because of his relatively short height. Having made numerous post-flight presentations about his experiences, his next trip was to Israel, on January 17, where he planned to return an Israeli Presidential banner that was signed by the President of Israel, Shimon Peres, and flown at the request of Israeli astronaut Ilan Ramon's widow, Rona Ramon.

Dr. Reisman was quite entertaining. His presentation was truly one that was cleverly crafted and appealed to all ages and all backgrounds.

Below: Baseballs from ceremonial pitch from the ISS to Yankee Stadium

Above: Reisman during first STS-123 EVA
Left: Israeli Presidential banner autographed by Shimon Peres

Film Screening

Sputnik Declassified

DOUGLAS YAZELL, ASSISTANT EDITOR

Right: Souvenir postcard handed out at this event

AIAA Houston Section co-sponsored (according to the ad on our section's web site) this excellent event. It started at 7:00 PM on Saturday, April 25, 2009, and was held at the Aurora Theater at 800 Aurora Street just south of the north 610 loop and just west of the I-45 freeway. An enthusiastic crowd of about 65 people of all ages paid $10 each to enjoy the reception, film screening, and Q & A session with writer and director Rushmore ~~–~~Rush" DeNooyer. The film is a 2007 episode of the PBS Nova series, ~~–~~Sputnik Declassified."

The Aurora Theater is a former church which looks like a house from the outside. Pews fill most of the single room and provide plenty of seating. From 7:00 to 8:00 PM we could enjoy talking with each other and our guest of honor. RealFilms (www.realfilms.org) presents such screenings of documentary films twice a month working with Documentary Alliance.

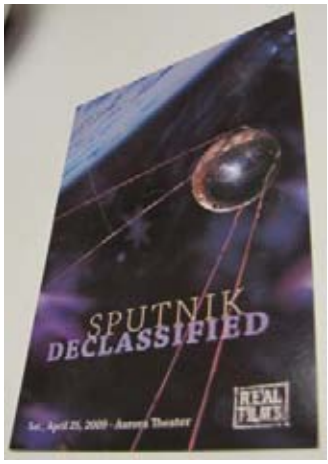
A central theme was new information made public in recent years about the Eisenhower administration. He worked in secret to keep his team focused on aerial spying on the Soviet Union to know their nuclear missile and rocket capabilities. The President reportedly ~~–~~illegally" sent airplanes over the USSR to take spy photographs. He was convinced that all sides would lose in a nuclear war. He sought the upper hand in treaty negotiations so that such a war would never start. The Pearl Harbor attack was fresh in his mind.

The President initiated a secret study from leaders at the Massachusetts Institute of Technology (MIT) to find the best way to accomplish this espionage, and spy satellites were the proposed solution. So satellites of this type were a top secret, top level priority for the administration years before the October 4, 1957 Sputnik launch which stunned the world.

Furthermore, the President's team concluded that the Soviet Union might very well claim that such a spy satellite over their country might be described by them as an act of war and an invasion of their air space. A US satellite of that type, or of any type, even a civilian satellite, might well have started a nuclear war initiated by the Soviet response. Every nation claimed its airspace in this manner, but how high that airspace extended had not been determined.

Once the Soviets launched first with Sputnik, President Eisenhower wrote in secret that they may have done us a favor. Since the American government did not claim our airspace had been violated, we established the principal that no country's national air space extended to Earth orbits.

For decades, the public, the press and historians concluded that President Eisenhower did not appreciate the obvious importance of the Space Race. But he and his administration simply did not want to give away the farm by disclosing such top secret policies. They confidently



stayed silent about that for the rest of their lives, despite the bad impression so many others had of them. Shortly after the end of the Eisenhower administration, our country launched its first such secret spy satellite, Corona. For many years after that, Americans had an upper hand in treaty negotiations and related foreign policy.

Mr. DeNooyer interviewed the late Mr. Ernst Stuhlinger (1913 – 2008), a member of the von Braun rocket engineering team in Huntsville, Alabama. Rush has a voicemail recording on his cell phone of Mr. Stuhlinger phoning to say that he saw the show on TV and liked it very much. Rush wants very much to save that for posterity, but he has not managed to make a permanent recording of that message which still resides on his cell phone. Maybe one of our 1150 or so members can volunteer to send him some instructions on how to record that in a permanent format?

Aeros & Autos at Ellington

Event

Douglas Yazell, Assistant Editor

Ellington Airport invited the public to attend Aeros & Autos 2009 on Saturday, May 9. This was a family event to raise money for Helpinga-hero.org and the Texas Lions Camp. The event lasted from 8:00 am to 4:00 pm and the weather was perfect. Live music supplemented the food and drinks available for purchase. Admission was only $5, and for those who wanted to display an automobile of some kind, admission was only $25.

The Kissing Sailor from the famous photograph was there, a world-famous celebrity. One or two hundred cars were on display, an amazing show. The US Army brought its 18-wheeler display to add to the festivities, and the Houston Police Department SWAT team displayed their amazing armored vehicle. Quite a few amazing aircraft were on display, including the B-17 from the Lone Star Flight Museum in Galveston.

The yellow Long-E-Z with canards near the nose and a propeller in the rear was recently purchased by Richard Sessions, President of the Houston Chapter of the Experimental Aircraft Association (www.eaa12.org).

This was an amazing show for a bargain price. The lunch available for purchase was excellent, and the related slow-moving line which was needlessly placed partially in the hot sun is a detail that will be easy to improve next year. I recommend this annual event for anyone. It's a great example of what Houston has to offer.

Above: Cars on display
Below: B-17 Flying Fortress from the Lone Star Flight Museum
Bottom, left: Douglas with Richard Sessions' LongEZ
Bottom, right: Glenn McDuffie, the famous "kissing sailor"

Report

Revisiting a DIRECT Approach

In our August 2007 issue of Horizons we included an article on the DIRECT STS derivative launch vehicle concept. A lot has happened in the intervening time, so we thought we'd include an update. We asked a few questions of Ross Tierney — one of the "front office" people who serve as the public interface to the team.

Horizons: The DIRECT team presented DIRECT v3.0 at ISDC recently. Can you explain what the major differences are in this new revision, and why the changes were made?

Ross Tierney: Early in 2008 the Ares-V development team encountered a serious issue with their design where the exhaust gasses from the rocket engines recirculate around the bottom of the launcher, which then experiences particularly high temperatures. The recirculating effect is well documented as "Plume-Induced Flow Separation" or PIFS - there is a famous picture of Apollo 11 flying which shows how PIFS often engulfs the entire aft area of any rocket (see attached) - and early pictures of the white STS-1 External Tank falling away clearly show the 'scorching' on the aft dome, again caused by PIFS.

Well, the high temperatures around the base of the vehicle caused by PIFS, are known as "Base Heating". It seems that Ares-V's Base Heating environment is particularly nasty, due to four main reasons: a) The large 10m diameter Core Stage punches a very large hole through the air, which creates a very large low-pressure region trailing the Core - and the hot PIFS gasses collect in this region, b) Being 37.5% larger than the current SRB's, the Ares-V's 5.5-segment SRB's produce an awful lot more hot exhaust gas to recirculate, c) With 6 x RS-68B main engines, they produce a great deal of hot gas which recirculates around the base of the Core too, and d) The RS-68's use a gas-generator cycle, and dump the exhaust from that overboard - directly into the immediate proximity of the base of the vehicle, which contributes to even greater heating.

In short, the Ares-V project found that the Base Heating environment is simply untenable for the Ablative Nozzle material which was to be utilized. The only solution is to switch to a Regeneratively Cooled Nozzle which pumps cryogenically cooled liquid hydrogen fuel through the nozzle wall to keep it cold. The problem is that the RS-68 was never designed to use a Regen nozzle so the engine will require extensive development to integrate this new feature.

DIRECT's Jupiter launchers use a fairly similar approach to Ares-V, although all Jupiters use a smaller 8.4m diameter Core Stage, smaller 4-segment SRB's and half the number of RS-68's - so our PIFS and Base Heating effects are considerably less taxing than Ares-V's. But still, this issue was serious

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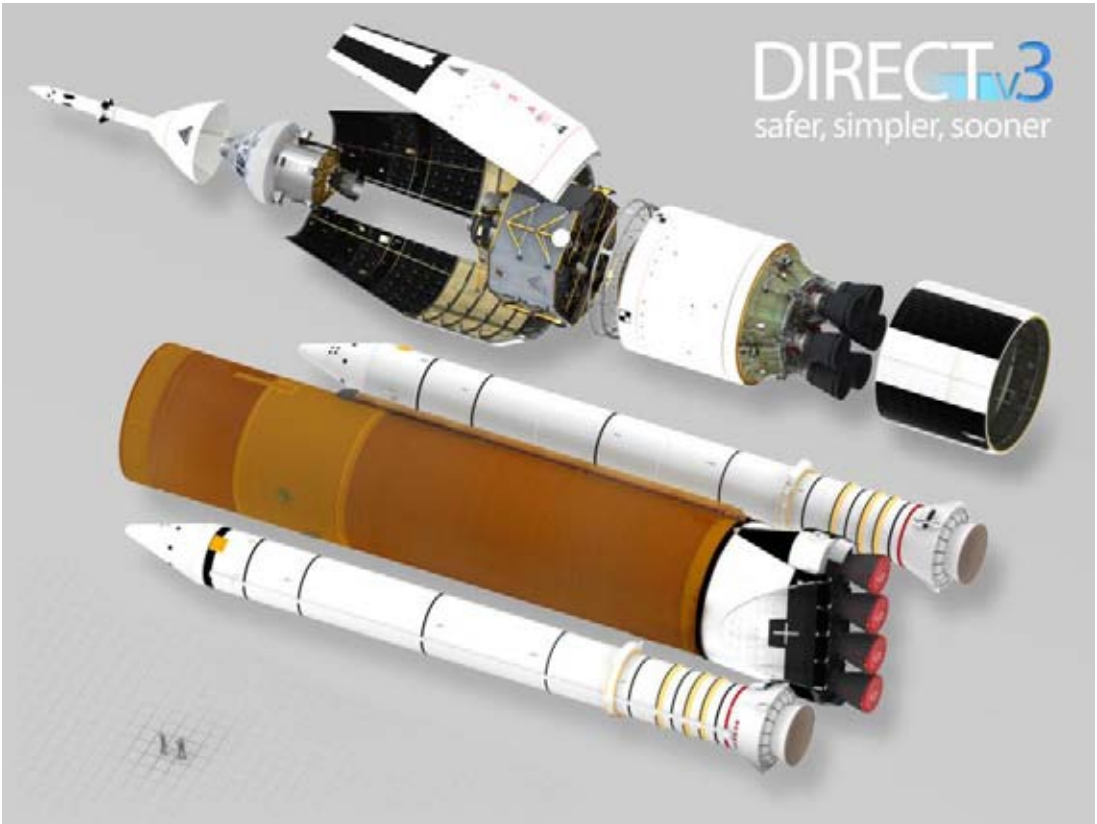
Below: Exploded diagram of the Jupiter-246 configuration.



Left: Apollo 11 launch, showing flames engulfing the aft area of the rocket due to Plume Induced Flow Separation (PIFS).

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enough to concern us. We spent almost a year investigating alternatives because we did not want to suddenly require a 6-year development program for the RS-68 Regen interfering with closing the "gap" after Shuttle. We wanted a solution which we could guarantee could be fielded operationally somewhere around 2012/2013.

When we examined all of the potential options we could think of, one stood out head-and-shoulders above the rest: Using the Space Shuttle Main Engine (SSME). Yes, they are more expensive than the RS-68, but when put into large, regular, production runs the cost is not all that different from the expected cost for the upgraded RS-68 Regen variant. There is no new development work needed for SSME and they do not require human-rating work because they are already fully qualified for human use. That significantly reduces both near-term costs and development schedule impacts. Eliminating billions in near-term development work more than makes up for the few tens of millions in per-unit production cost differences later.

When we completed our analysis, we also found a significant performance advantage courtesy of the SSME in this configuration. Whereas the old RS-68-based Jupiter-120 could loft around 45mT to ISS, the new SSME-based Jupiter-130 can loft more like 70mT, which is quite an impressive feat given the fact that the Core Stage propellant capacity has not changed. This substantially improved performance is all due to the magic of the high-efficiency 452 sec vacuum Isp produced by the SSME.

For Lunar missions, we found something even more impressive: where the older RS-68 configuration needed a very large and powerful 2-engine Upper Stage, an optimized SSME-based Core does not. The SSME Core Stage burns longer and produces greater velocities and altitudes before staging. That leaves less work for an Upper Stage to do. And that means the Upper Stage can be made significantly smaller, lighter and doesn't have to be as powerful to still serve the same functions. More importantly; reducing the mass of the Upper Stage has massive impacts on Lunar TLI performance. For every kilogram of extra mass in the Earth Departure Stage mass, you essentially lose 3 kilograms of useful payload mass which can be sent through TLI. So, not only could the tanking be made smaller, but the pair of heavy J-2X engines were no longer required. We have a

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Left: STS-1 External Tank falling away after separation, showing the scorching on the aft dome caused by PIFS.

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number of different designs in DIRECT v3.0's proposal, but one which we think of as 'best' is a configuration using a cluster of 6 x RL-10B-2 engines (as used by Delta-IV) to make a Jupiter-246 configuration. It makes for a highly efficient (459 sec vac Isp), yet very light-weight design which also has a great deal of engine-out capability. All of our current performance analysis for these configurations assume a worst-case scenario where one of the six engines fails to start at all during the ascent portion of the launch and then a second of the engines also fails to start for the TLI burn - that would be a pretty bad scenario when you think about it, but even in that situation, this configuration can still exceed the Constellation Program's TLI performance requirements (71.1mT thru TLI) by more than 11% (79.1mT thru TLI) while meeting all of Constellation's Ground Rules & Assumptions. This engine is already in production today and only requires human-rating, which we recommend be done as part of a program to human-rate the Delta-IV Heavy as a second human launch system.

As I mentioned, there are a variety of different Upper Stage configurations for Jupiter which are also viable: We have a Jupiter-241 which uses a single J-2X, a Jupiter-244 which would use a cluster of 4 x RL-60's and we also have a Jupiter-247 configuration which uses the slightly less powerful RL-10A-4-2 from the Atlas-V. All offer sufficient performance and safety, so the deciding factor really comes down to cost and schedule, and that is a decision which we intend to leave to NASA if they adopt DIRECT for themselves.

We really like having lots of options to choose from "down the road". All we really need to decide to build today is the Jupiter-130 -- which is the foundation for everything later. But it isn't urgent to decide what configuration the Upper Stage will be. That decision could actually wait a few more years.

Horizons: Was the DIRECT team contacted by the Obama transition team?

Ross Tierney: We made a Presentation to the Transition Team in early January. We have chosen not to comment on those discussions.

Horizons: Can you remind us of who constitutes the DIRECT team?

Ross Tierney: Currently the DIRECT Team consists of 69 anonymous NASA/Contractor engineers & managers from across the nation and across the industry. They form our "back office" team who do all of the serious number-crunching for us. There are currently 9 more people on the team who form the more public "front office", of which Chuck Longton, Steve Metschan and myself are probably the best-known.

Horizons: Has NASA formally reviewed the Direct concept? If so, what were their conclusions?

Ross Tierney: NASA conducted a Performance Analysis of DIRECT v2.0 back in 2007. The results of that report were not published for a year, until WIRED magazine obtained a copy of the report. The report concluded that DIRECT would not work. However, upon review the analysis was deeply flawed in a lot of different ways. We recently wrote a 100 page Rebuttal to this analysis, identifying all of the mistakes and attempting to show how they each negatively affected the final results of that analysis. A corrected analysis has not been performed by NASA at this time, although we are hoping that the Augustine Commission will conduct a fair assessment this time.

Horizons: At this point does it make any sense to "change horses" to another architecture after so much work has already been done?

Ross Tierney: You touch on an extremely important point with your question, a point which is so often overlooked by most people:-

Today, we are currently on the Space Shuttle horse, not the Ares horse.

It seems to me that Ares is actually the scenario which requires us to 'switch horses'. DIRECT is really just an evolution of the current Shuttle design, not a replacement with a completely new design.

DIRECT plans to re-use most of the things which have already been done so far. All of the development teams we need are currently in-place and are up-to-speed, so they are ready to hit the ground running on DIRECT. DIRECT's plans still need Lockheed Martin to build the Orion spacecraft. Jupiter still requires an Instrumentation Unit, so Boeing's efforts there will not go to any waste. We still require an Upper Stage, so why not modify Boeing's existing contract for that task too? The new & refurbished

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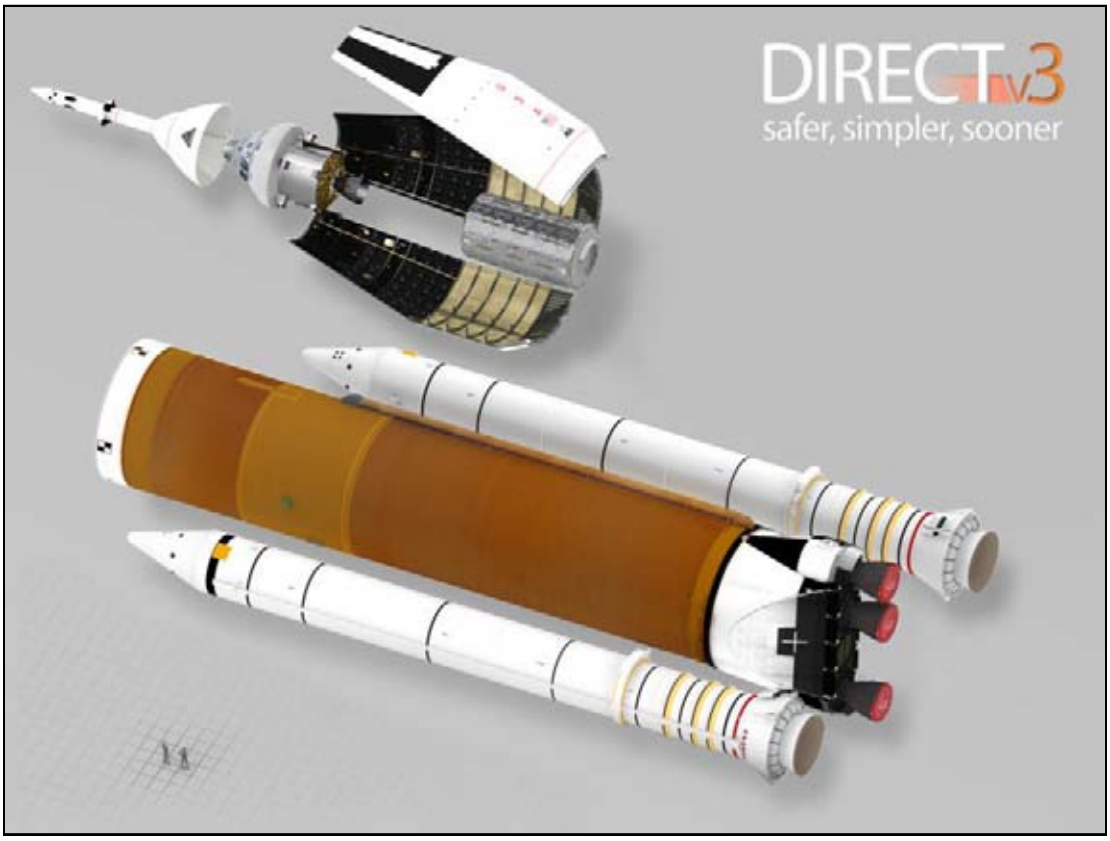
test stands, Launch & Mission control refurbishment and work already carried out in modernizing facilities like the Operations & Checkout building at Kennedy are all facilities we intend to use just as fully as Ares did. We even have uses for the new Launch Tower currently being constructed for Ares-I. And if there is a political need to build the 5-segment SRB's and the J-2X engine, Jupiter can still use them later in the program - as 'upgrades'. We have constructed our proposal in order to minimize the 'waste' all throughout the program.

So I would prefer to reframe the question: Should we still plan to switch horses to Ares, or should we stay on the horse we are currently riding and focus our efforts on improving it and making it safer, more capable and more affordable?

Setting technical difficulties with Ares aside for a moment, the current architecture is actually in serious jeopardy for a variety of reasons, but primarily the problems are fiscal. When the Vision for Space Exploration was first proposed back in 2005, NASA was promised a vibrant budget which would be increased to the tune of billions of dollars per year in order to help pay for this new Vision. The agency proceeded to design an architecture which fitted that promised budget. However, that extra funding never transpired. In real terms, NASA's budget has actually reduced, twice, since then. Today we find ourselves in an economy which isn't what it was just four years ago and even further squeezes on NASA's discretionary budget allocation are expected over the coming years. What this means is that NASA's original plans are simply not affordable any longer. The bottom line is that we must find another, more affordable, path to pursue or we will be faced with having to give up the Exploration program altogether.

The most logical ways to reduce costs are to reduce requirements. The critical question which started DIRECT in the first place still applies today: "Why build two new launch systems if you can build one which can do the same job?". As a corollary to that, I would also add: "Why spend the extra money developing any new launcher which requires all-new boosters, all-new stages, all-new engines, all-new manufacturing and all-new launch infrastructure if there are options which can use existing equipment in all those areas?".

If you ask those two questions, then factor in the political requirements to save the Shuttle workforce and the performance requirements for the missions which NASA intends to fly, we are quite convinced that any reasonable analysis of the situation will end-up following a path very similar to DIRECT's. That is, after all, how we put this proposal together in the first place and it is also what drove NASA to precisely the same conclusions in 1991 during the NLS program. The only difference today is that Shuttle is going away — very soon.



Above: Exploded diagram of the Jupiter-130 configuration

1940 Air Terminal

HobbyFest 2009: AIAA Historic Aerospace Site

DOUGLAS YAZELL, ASSISTANT EDITOR

Above: The 1940 Air Terminal Museum (www.1940airterminal.org) in a photograph from 2009

Below: Past Chair Douglas Yazell, Chair Elect Ellen Gillespie, and Chair of our History Committee, Chester Vaughan (photo by David Gillespie)

Hobby Fest 2009 at Hobby Airport was a big success despite the heavy rain which decreased attendance. Organizers guessed at a crowd size of 1,000 people in advance if the weather was good, but the storm which arrived was historic in its intensity, in keeping with our planned 15-minute ceremony to unveil the plaque celebrating this building as an AIAA Historic Aerospace Site.

Our brief ceremony was scheduled for 1:30 PM on Saturday, April 18, 2009, at the 1940 Air Terminal Museum at Hobby Airport. The museum presents an excellent monthly program on the third Saturday of each month called Wings and Wheels, as described at www.1940airterminal.org. Once a year, this becomes an even bigger event, Hobby Fest, and this year April 19 was the date. Hobby Fest hours were 11:00 AM to 4:00 PM. The rain came and went when some of us arrived at 11:00 AM. By noon, the rain was heavy and the winds were strong. Unlike most Wings and Wheels events, Hobby Fest was so big that the lunch meals were served in a different building, the 4th building as we walked past some hangars displaying some remarkable vintage aircraft.

As organizers dealt with flooding of more than a foot of water in some of these buildings, our ceremony was postponed a few times until we finally succeeded in scheduling it for 3:30 PM. Our AIAA liaison for historic aerospace sites, Emily Springer, was in town from Reston, Virginia, but she needed to leave by 2:00 PM to catch a flight at the Bush Intercontinental Airport north of Houston. Captain A. J. High, a lead museum volunteer and retired commercial airline pilot, left to attend a wedding in Sugarland, but he returned during our ceremony because the roads were flooded (Telephone Road and Airport Boulevard), keeping us all at the museum for an extra hour or two and the end of the festivities of that day.

We quickly introduced our main speaker, Mr. Chester A. Vaughan, Chair of our AIAA Houston Section history committee in our technical branch. Mr. Vaughan is retired from a distinguished NASA career and a later 10-year career with The Boeing Company. With Mr. Drew Coats (President, Houston Aeronautical Heritage Society) kindly appearing with him for this presentation, Mr. Vaughan spoke about the history of AIAA and our AIAA support for this inspiring restoration and museum project, the 1940 Air Terminal Museum. Mr. Coats mentioned in his remarks that many cities erected similar inspiring buildings during the golden age of aviation that

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Above, left: A handshake to symbolize the delivery of the AIAA Historic Aerospace Site plaque: Mr. Drew Coats and Mr. Chester Vaughan.

Above: Museum and Hobby Fest 2009 volunteer Frederick Stafford was singled out from among the many volunteers for this award, presented by Drew Coats. Mr. Stafford provided superb leadership for the last two years. He took on the renovation of the museum's exhibit hangar. He helped to oversee the renovation of the Air Terminal Building and was vital to its success. He is also a welder and a painter when he can find the time.

Below: From a crowd of about 50 people, Mr. Coats invited museum volunteers to join us for a group photo.
(photos by David Gillespie)

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they were not able to preserve, so Houston's heritage at this site is especially precious for Houstonians, all Americans, and people everywhere who may one day visit this new museum.

With a final handshake to symbolize the delivery of this AIAA plaque, we concluded our ceremony. An inspiring award ceremony followed, with a plaque given from Mr. Coats to just one of the many volunteers making Hobby Fest 2009 possible.

Museum volunteers left with caution one at a time and phoned back to us with reports of which roads were open or closed due to flooding. When I finally left the museum to go home that night in my big SUV, a museum volunteer, one of my neighbors two blocks from my home in the Houston Clear Lake area, followed me in her sedan with her dog, McDuff, a young and handsome Bassett Hound. We took Telephone Road north all the way to the South Loop (Interstate Highway 610) where it joined with the I-45 freeway, where we took I-45 South. We kept in touch with our cell phones. When we saw the flooding on many of stretches of frontage road to our right, parallel to the freeway, we stopped at one point so that she could abandon her car on the shoulder as many others had done, since she did not think her car could pass as well as mine when we later came to our exit, Clear Lake City Boulevard. We changed our minds, driving to get closer to our exit before deciding about that. Flooding on the frontage roads was not so bad near our exit, so we made it safely to our homes after an unforgettable, historic day.

AIAA Historic Aerospace Sites

Within a few days, The Smithsonian web site, http://www.airspacemag.com/snapshot/43626647.html, proudly displayed a feature about our brief event and the new AIAA Historic Aerospace Site in Houston, the 1940 Air Terminal Building at Hobby Airport.

Plaque wording:

Houston Air Terminal

The 1940 Air Terminal is a beautiful and rare example of classic art deco airport architecture from the golden age of flight. Designed by noted architect Joseph Finger, the Terminal was built to meet Houston's growing role as a major center for air commerce in the 1930s. Its grand opening by the City of Houston took place on September 28, 1940, at Houston Municipal Airport, now known as Hobby Airport. The 1940 Air Terminal was a destination for early airline service from points across Texas and the United States and international service, beginning in 1948. The 1940 Air Terminal also was at the center of early business aviation and general aviation. Within its walls, the 1940 Air Terminal housed rapidly advancing air traffic control and meteorological technology. It served as Houston's primary commercial air terminal until 1954.

AIAA Historic Aerospace Sites from the history technical committee, www.aiaa.org:

1. First Aerojet Manufacturing Site, Pasadena, CA 2000
2. "The Rocket Site," Edwards AFB, CA 2000
3. Dutch Flats Airport, San Diego, CA 2000
4. Goddard Rocket Launch Site, Auburn, MA 2000
5. Kitty Hawk, NC 2000
6. Huffman Prairie, Dayton, OH 2000
7. Air Force Flight Test Center, Edwards AFB, CA 2001
8. Rocketdyne, Canoga Park, CA 2001
9. Arnold Engineering Development Company, Arnold AFB, TN 2001
10. NASA Langley Research Center 2001
11. Allegany Ballistics Lab, Rocket Center, WV 2001
12. NASA Marshall Space Flight Center, Huntsville, AL 2002
13. Oakland Municipal Airport, Oakland, CA 2002
14. North Island Naval Air Station, San Diego, CA 2002
15. The Boeing Red Barn, Seattle, WA 2002
16. Pt. Mugu Naval Base, CA 2003
17. College Park Airport, College Park, MD 2003
18. First Thiokol Manufacturing Plant, Elkton, MD 2003
19. Bendix Aviation Corporation, Teterboro, NJ 2003
20. Purdue University Airport, W. Lafayette, IN 2004
21. Aeronautical Concourse of the Louisiana Purchase Exposition, St. Louis, MO 2004
22. Reaction Motors, Inc., Denville, NJ 2004
23. White Sands Missile Range, NM 2004
24. China Lake, CA 2005
25. Travelair Airplane Manufacturing Co., Wichita, KS 2005
26. NASA Johnson Space Center, TX 2005
27. Vandenburg AFB, CA 2006
28. Rentschler Field, CT 2006
29. Cape Canaveral Air Force Base, FL 2006
30. Patuxent River Naval Air Station, MD 2006
31. Picatinny Arsenal, NJ 2006
32. Great Kills Park, Staten Island, NY 2006
33. NASA Stennis Space Center, Bay St. Louis, MS 2007
34. Cincinnati Observatory, Cincinnati, Ohio 2007
35. GE Re-entry Systems, Philadelphia 2007
36. FAA William J. Hughes Technical Center, Atlantic City, NJ 2008
37. 1940 Air Terminal, Hobby Airport, Houston, TX 2008
38. NASA Ames Research Center, Moffett Field, CA 2009
39. Rockwell/North American Industrial Site, Downey, CA 2009
40. Igor Sikorsky Airport and Vought-Sikorsky Plant, Bridgeport, CT 2009
41. Eglin Air Force Base, FL 2009
42. Cornell Aeronautical Laboratory/Calspan, Buffalo, NY Undated

International Sites

1. First Balloon Launch Site, Annonay, France 2001
2. First Motorized Flight in Canada, Baddeck, Nova Scotia 2004
3. Farnborough Research Establishment, UK 2004
4. Home of Alberto Santos Dumont, Brazil 2005
5. Woomera, South Australia 2007
6. Getafe Airbase, Spain 2008
7. Dunsfold Aerodrome, UK 2008
8. Honeysuckle Creek/Tidbinbilla Tracking Array, ACT, Australia 2009

Other

Tranquility Base, The Moon 2000

Above: Views of the newly renovated rocket park at Johnson Space Center, including the Saturn V building exterior and interior

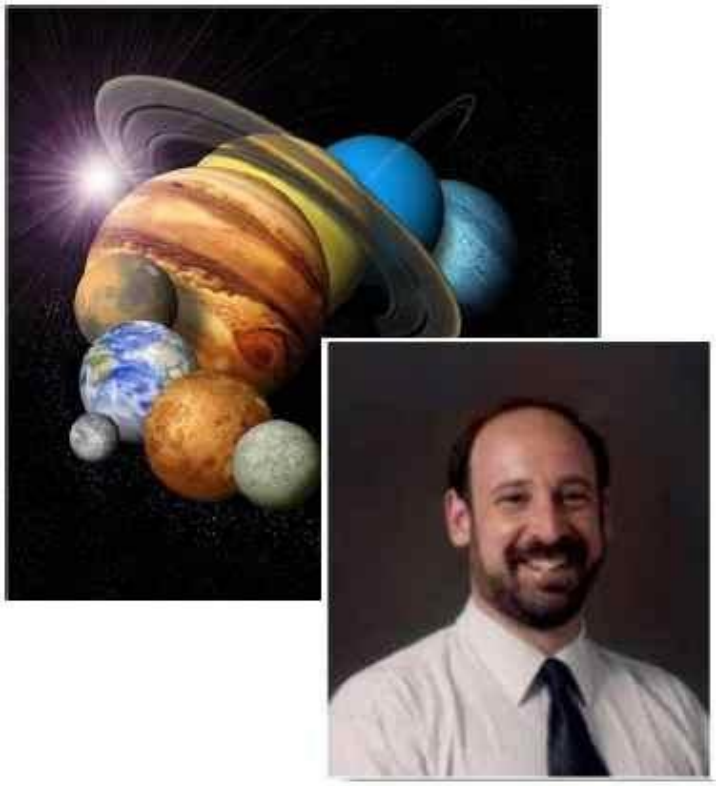
Left: Little Joe and other displays

Below: The commemorative wall on NASA Road 1 near Space Center Houston and NASA/JSC, representing the partners on the nearly -completed International Space Station.

Dinner Meeting

The Future of U.S. Planetary Exploration

DOUGLAS YAZELL, ASSISTANT EDITOR



Above: Dr. Randii Wessen

Dr. Randii Wessen, an AIAA Distinguished Lecturer, was welcomed as our honored guest and dinner speaker by a crowd of about 50 people for our AIAA Houston Section's annual awards dinner on Friday, June 5, 2009, at the NASA/ JSC Gilruth Center Alamo Ballroom.

Dr. Randii Wessen has been an employee of the California Institute of Technology's Jet Propulsion Laboratory for twenty-five years. He is currently the Deputy Manager of the Project Formulation Office. Prior to this Dr. Wessen was the Navigator Program System Engineer. This program's goal is the detection of Earth-like planets around other stars, if they exist. He also was the Telecommunications & Mission Systems Manager for the Mars Program, Manager of the Cassini Science Planning & Operations Element, the Galileo Deputy Sequence Team Chief, and the Voyager Science Sequence Coordinator for the Uranus & Neptune and much more. He co-authored the books *Neptune: the Planet, Rings and Satellites* and *Planetary Ring Systems*. He was the recipient of NASA's Exceptional Service Medal for his contributions to the Voyager 2 Neptune Encounter and has nine NASA Group Achievement Awards.

Prior to the technical presentation, the AIAA end of year awards ceremony took place. Sean Carter won the Houston Section Outstanding Performance Award for his second year as Vice Chair Technical and grassroots based Annual Technical Symposium. Secretary Sarah Shull and Programs Chair Melissa Gordon both received Apollo 40th Anniversary globes as special achievement work for their contributions during the year. Doulas Yazell and Albert Jackson were introduced as this year's AIAA Fellow nominees. Chair Chad Brinkley received a 2007-2008 AIAA Special Service Citation for his corporate funding skills.

The newly elected AIAA Houston Executive Council members in attendance were introduced for the year starting July 2009 – July 2010. The new 45-person council (with 20 elected members) includes: Past Chair Chad Brinkley, Chair Ellen Gillespie, Chair Elect Sarah Shull, Vice Chair Technical Satya Pilla, Vice Chair Ops Nick Plantazis, Treasurer Sean Carter, and Secretary Daniel Nobles. Our three new Councilors are Shirley Brandt, Irene Chan, and Dr. Michael Lembeck.

Dr. Wessen's visit to Houston started at Hobby Airport upon his arrival. Our Past-Chair Douglas Yazell took Dr. Wessen for an impromptu guided tour of the 1940 Air Terminal Museum (www.1940airterminal.org) at the airport near one of the runways. Museum administrator Megan Lickliter was our host and other VIPs such as Captain A.J. High and

(Continued on page 17)

Right: From left to right, Distinguished Lecturer Dr. Randii Wessen, Chair-Elect Ellen Gillespie, Programs Chair Melissa Gordon, and Chair Chad Brinkley.

(Continued from page 16)
Drew Coats were there, too, as they prepared for their annual (black tie optional) formal dinner which was to take place the next evening. Dr. Wessen was able to visit the AIAA Historic Aerospace Site plaque there before driving to NASA/Johnson Space Center to see Rocket Park, including Houston's other AIAA Historic Aerospace Site plaque. Programs Chair Melissa Gordon and her husband drove Dr. Wessen back to Hobby Airport the next morning.

Planetary exploration is composed of a number of evolutionary missions punctuated by a few revolutionary ones. Planetary exploration has progressed into orbiter missions that remain in orbit for years at a time, enabling them to study atmospheric dynamics, surface morphology and magnetospheric science. Orbiter missions have been sent to Venus, Earth, Mars, Jupiter and Saturn. This presentation covered the robotic planetary missions currently in operations at the Jet Propulsion Laboratory and those planned for upcoming decades. It included descriptions of missions to major planets, minor bodies and the search for "Terra Nova," the search for an Earth-like planet outside of our Solar System.

Left: Starting July 1, 2009, these council leaders for our section will be (left to right) Chair Ellen Gillespie, Chair Elect Sarah Shull, Secretary Daniel Nobles, Vice Chair Technical Satya Pilla, and Past Chair Chad Brinkley.

Far left: Programs Chair Melissa Gordon presents a Special Service Citation to Chair Chad Brinkley for his fund-raising work last year when he was Chair-Elect. A maximum of five of these citations are awarded in each region each year, and our section received all five of them in our 4-state region last year.

Left: Chair Elect Ellen Gillespie presents an Outstanding Contributions and Dedicated Services award to Programs Chair Melissa Gordon.

ATS2009

2009 Annual Technical Symposium

STEVEN EVERETT, EDITOR

Above: Registration table at the 2009 Annual Technical Symposium in the Gilruth building at the Johnson Space Center.

The AIAA Houston Section hosted its 2009 Annual Technical Symposium (ATS) on Friday, May 15, in the Gilruth Center at Johnson Space Center. The morning began in the Alamo Ballroom as Sean Carter and Ellen Gillespie, the organizing committee co-chairs, acknowledged the corporate sponsors and welcomed a somewhat sparse crowd of around 60 people. Sean explained how the local chapter is generally structured into operations and technical committees. The ATS gives the local section a chance to showcase its technical committees, around which each of the technical tracks during the day was organized.

Ellen then introduced the morning's keynote speaker, Wayne Rast, who spoke about the Public Policy committee in AIAA and gave an overview of this year's Congressional Visit Day in a speech entitled "A New Washington." Mr. Rast was a Congressional Fellow in the mid 1990's, has served on the National Committee for Public Policy in AIAA, and is currently the Deputy Director for Region IV.

Mr. Rast began by expressing his pleasure at being able to increase communication between the technical and public policy aspects of the chapter and hoped that this would be effective in encouraging new involvement from the local members. He explained that the purpose of the public policy group in AIAA is to formulate the organization's position on various issues and represent those viewpoints to Congress through formal and informal channels, as well as getting members more involved on Capitol Hill.

One of the main events in which the Public Policy group assists is the annual Congressional Visit Day, held this year on March 17 and 18 for the purpose of "raising awareness of the long term value that science, engineering, and technology bring to America." During this event, representatives meet with various members of Congress to explain the current and anticipated issues relevant to the aerospace community. The Houston section also attempts to personalize the message brought to Congress by emphasizing issues of particular importance to the local members, such as manned space flight. The main point made in the package presented on Capitol Hill, which was reviewed for the audience by Mr. Rast, was the importance of success in balancing shuttle retirement, ISS operation, and Constellation development. His impression from the visit was that the Senators understood the pertinent issues as well as the concerns expressed over the delay in selection of a new NASA Administrator.

The primary challenge Mr. Rast saw was getting a larger number of members engaged in the political process, many of whom see it as distasteful, uninteresting, or too convoluted (a view made all the more ironic by the complexity of the work done by many in our field.) He pointed out that the consequence of not being involved is the leaving of decisions

Right: Keynote speaker and AIAA Public Policy committee member Wayne Rast.

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affecting our livelihoods and careers to those who are less informed or to random chance. He hopes to provide opportunities for communication and involvement through events such as an upcoming dinner with representatives organized by the local chapter.

In addressing several questions from the audience, Mr. Rast pointed out that the Congressional Visit representation was for the aerospace profession rather than a particular industry or company. He also was hopeful that the group could influence the conclusions from the ongoing review of the NASA budget proposal by the Augustine commission. Mr. Rast was given a token of appreciation from AIAA by Ellen Gillespie before the first morning break.

The five parallel technical tracks that began in the morning and continued until after lunch featured topics ranging from career development to bioastronautics and space mission trajectory design. Among the speakers were local chapter members as well as Rob Landis from Ames and NASA Alumni League member and Apollo veteran Norman Chaffee. Copies of slides presented will be available online at the AIAA-Houston website at http://aiaa-houston.org.

After a tasty lunch provided as part of the conference registration, a panel consisting of veterans from the Apollo X mission was invited to share their background and experiences during that historic era to a crowd which had grown considerably since the morning. Included on the panel were Ken Young, who facilitated the discussion, Henry Pohl, Dave Alexander, Gary Johnson, and Glynn Lunney. Ken began by remembering those members of the Apollo team who had already passed on, including Sam Wilson and Bob Becker. Ken's impression was that Apollo X was viewed as an ~~–o~~rphan" as compared with the boldness of Apollo VIII, the historic nature of Apollo XI, and the drama of Apollo XIII. Nevertheless, it was on Apollo X that the test of rendezvous in Lunar orbit was accomplished, the Lunar Excursion Module (LEM) approached the surface to within 60 nautical miles, and the effect of Lunar mass concentrations on the Lunar orbit was assessed. Ken noted that regardless of the rumors of a last minute landing attempt by an overanxious crew or overly ambitious program management, the Apollo X LEM design was too heavy to have ever launched again from the Lunar surface. The only anomalies of the mission were a trans-Lunar injection burn vibration, probably due to pogo effects, and a sudden unexpected orientation maneuver as the ascent stage was fired to rendezvous with the command module. It was

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ATS2009

Left: Apollo X panel, featuring, from left to right, Ken Young, Henry Pohl, Glynn Lunney. Dave Alexander, and Gary Johnson.

Left: Norman Chaffee and audience members Dr. Steven Everett, Horizons editor (wearing a tie), Andrew Hobokan, and (wearing a coat), Wes Kelly of Triton Systems LLC (www.stellar-j.com), whose Stellar J rocketplane concept was the subject of a past issue of Horizons. Mr. Chaffee, a past AIAA Houston Section Chair (1980 – 1981), spoke about lessons learned with respect to reaction control system (RCS) propulsion for Mercury, Gemini, and Apollo.

Above: Robert Carmody (Lockheed Martin) speaks on the real-time console tool Power Planning and Analysis Tool (PLATO) that supports the ISS power resource planning and forecasting.

Below: Svetlana Hanson (Tietronix Software, Inc.) during her overview of the U.S.-Russian cooperation in space biology and medicine.

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later determined that one of the crew in their bulky suits had inadvertently changed a switch setting, which altered the frame of reference being used by guidance. The sudden resulting pitch of the capsule prompted the infamous on-the-air exclamation by Gene Cernan, "son-of-a-b*, what the h* happened?!"

Henry Pohl continued the discussion by reminiscing about the events that led up to the Apollo X mission. He highlighted the rapid progresses in navigation technology by pointing out that 25 years before this mission, the United States was losing a third of its bomber missions while unsuccessfully trying to find South Pacific refueling sites. In four years, they had to develop systems that had never been built, they had no vacuum experience, and there were problems with instabilities in the ascent engine, and explosions during RCS jet firing tests. In the end, though, they built a system that was "faster, better, and cheaper" than any system built subsequently. He attributed their amazing success to the increasingly rare hands-on experience of the program managers, a consistent set of requirements and goals, the desire the beat the Russians to the Moon, and the sensitivity of the managers to the concerns of the engineers.

The next panelist to speak was Glynn Lunney, who noted that while the Gemini project seemed to limp through its missions, the industry had matured enough to make Apollo an aggressive and successful project, making only four precursor flights before the Moon landing. The quick progress was possible because many technological problems were solved while in Earth orbit during the former set of missions, including use of digital computers, rendezvous, guided entry, extravehicular activity procedures, and many practical issues. He characterized their leadership as terrific, competent, decisive, and bold, and noted that the flight controllers, planners and crew had bonded as a single team.

Dave Alexander related some of the more humorous incidents he was involved in during the program. He told a story of a briefing on Lunar rendezvous and rescue procedures requested by the crew a few days before the Apollo X mission. Along with Orbital Missions Analysis Branch Chief Ed Lineberry, Alexander travelled to the Cape to find that their briefing was to be held after dinner and a long day in the simulator by Young, Stafford, and Cernan. That evening during the meeting, John Young was so tired that he fell asleep and began audibly snoring. When Stafford woke him, he stated he was too tired and that "Houston will tell me what to do" in the event of an emergency. Cernan, who was incensed because it was Young who would have to rescue them if they got into trouble, threatened to dump water over his head if he fell asleep again. In another incident, Alexander said he was approached by Cernan during the Apollo XI mission preparations. He was told that the Apollo X crew had nicked some of their suit padding in the access tunnel, which caused a bit of fuzz to float through the cabin and into their spacesuits. He claimed it was this that prompted his misinterpreted outburst during the Lunar ascent "Some of us itch!"

Gary Johnson continued the discussion with lessons he learned as he supported the electrical power distribution and sequencing in the Mission Evaluation Room. During the Apollo X mission after the incident during ascent, there was a fuel cell failure, prompting an evaluation of power saving measures that could be taken. A second failure, jokingly anticipated by Young, also occurred on the far side of the Moon, which turned out to be due only to temperature variations in the sensor. John-

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son said that it was the triple redundancy that allowed the system to ensure mission success and crew survival, a philosophy referred to now as "fail op, fail safe." However, Johnson noted that weight savings were possible by varying the redundancy by system. New technology such as the fuel cells and AC inverters, were triply redundant, while proven technology such as the electrical main bus relays had only two levels of redundancy. Johnson also emphasized the importance of manual backup systems as a level of redundancy. The rendezvous was enabled after the incident during ascent because of the capability for manual control by the crew. He pointed out that during the Skylab program, an incorrectly pulled circuit breaker disabled the gimbal power rather than the auto stabilization control when a certain interface was deadfaced before command module separation. When nothing happened during auto re-orientation in preparation for reentry, Ed Gibson was able to orient the spacecraft under manual direct control of the Reaction Control System (RCS) and preserve the mission and the crew.

The first question as the floor was opened to the audience was who did the panel feel was the greatest pilot in the program? While Lunney's diplomatic answer during each mission was "the crew that we are now flying," all agreed that Neil Armstrong was the perfect choice for the first man to walk on the Moon and an ideal match to fly with Buzz Aldrin. His coolness under pressure was demonstrated by the incident in which he was found casually reading a textbook immediately after his harrowing ejection from the "flying bedstead," and Young noted that his pulse rate even during the most stressful missions was typically low. One question addressed the differences in the way the ascent module reacted during separation above the surface as opposed to the planned ascent from the surface. It was agreed that the uncertainty of the position of fuel in the tanks used for ascent while still in orbit was indeed a concern. On a side note, Young believed that it was during this rehearsal that man had travelled the fastest relative velocity with respect to a nearby surface. When asked about the thought processes that led each panel member to join the space program, some said they had joined their respective group because of the convenience of the opportunity at the time, but most cited the recent Sputnik launch and a desire to be a part of winning the Cold War and beating the Russians to the Moon.

As the lunch hour ended, questions from the eager and attentive audience had to be cut short by Sean Carter, who pointed out that with no Cold War going on now, the achievements of the previous generation as represented by the members of this panel had become the younger generation's inspiration for becoming a part of man's exploration of space. Young noted later that things are different now, but the new generation certainly has the potential for doing great things as well. Al Jackson, who had organized the panel, mentioned his difficulty in even assembling this group of men, and gave a small crystal ornament to each in thanks for participating. Doorprizes were distributed, including a beautiful wooden model provided by ATEC and won by Ajay Schindel. In closing, Alexander also wanted to mention that while they had smart guys and great leaders involved, he believed that "somebody up there was looking out for us." Lunney noted the irony of the fact that it was the oxygen tank from Apollo X that was ultimately placed in the ill-fated Apollo XIII module, and how an earlier mishap could have caused history to play out very differently if not for luck or providence. In one of the most striking closing quotes, Pohl recalled that Robert Gilruth had prophetically said that "if we ever decide to go back to the Moon, we will find out just how difficult it really was."

After a brief break, the afternoon technical sessions completed another successful Technical Symposium. As usual, the value of the technical information available in the panels and presentations was second only to the opportunity to meet and establish contacts with other members of our profession afforded by this annual event. We will all be looking forward to another enjoyable event next spring.

Charts presented by each speaker will be posted on the AIAA Houston Chapter website at aiaa-houston.org

Above: Marlo Graves (Boeing) highlights the Chinese space program and discusses the how local AIAA members can participate with our Chinese sister sections.

International Activities

DOUGLAS YAZELL, ASSISTANT EDITOR

International Space Activities (ISAC) Committee Report

Left: International Space Activities Committee, from left to right, Nelson Brown, David Hanson, Svetlana Hanson, Jeri Brown, Marlo Graves, Bianca Guerrero, Amy Shah, and Leopold Eyharts.

The group photo summarizes the successful afternoon for our section's ISAC at our section's excellent Annual Technical Symposium. From left to right, Nelson Brown, David Hanson, Svetlana Hanson, Jeri Brown, Marlo Graves, Bianca Guerrero, Amy Shah, and Leopold Eyharts.

We started our afternoon session with European Space Agency (ESA) astronaut Leopold Eyharts making a presentation about his latest space mission: launching on STS-122, bringing the European Space Agency's Columbus laboratory module up to speed, returning on STS-123, and doing much more during that eventful period on the International Space Station (ISS) as a member of ISS Expedition 16. Svetlana Hanson of Tietronix Software, Inc., was our next presenter, speaking about, "Overview of the US-Russian Cooperation in Space Biology and Medicine." Our last presenter was Marlo S. Graves of the The Boeing Company, speaking about AIAA Houston Section sister sections in China (Shanghai and Beijing).

Bianca Guerro and Amy Shah attended as representatives of The Health Museum (www.thehealthmuseum.org), which is located in the Houston museum district. From Memorial Day to Labor Day the museum will present an exhibit called Facing Mars, making its US debut after its arrival from Canada. Details are available on the internet, and it is quite an extensive exhibit.

AIAA Houston Section and our French sister section l'Association Aeronautique et Astronautique de France, Toulouse – Mid-Pyreneees Chapter (AAAF TMP), send our special thanks to ESA astronaut Leopold Eyharts for taking the time from his busy schedule to be with us on this memorable day.

AAAF Election Results

Presented here are the results from the elections on May 22, 2009, for officers in our French sister section, the Association Aeronautique et Astronautique de France, Toulouse – Midi-Pyrenees Chapter (AAAF TMP) Bureau Group Regional (Regional Group Office). Congratulations from Houston, Texas, USA, to these volunteers and workers who continue to be of service to our profession, making the world a better place in very important and very inspiring ways. Our section will update these results on our International Space Activities Committee (ISAC) web page: www.aiaa-houston.org/tc/isac.

President: Francis GUIMERA, retired, AIRBUS Central Entity

Vice-Presidentst (Aerronautics): Alain CHEVALIER, AIRBUS France

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Vice President (Space): Michel FAUVEAU, retired, CNES

Vice President (Operations + Research & Technology): Alice TORGUE, retired, ONERA

Secretary: Philippe MAIRET, AIRBUS France

Secretary Adjoint: Cristiane BLEMONT, retired, CNES

Treasurer: Guy DESTARAC, retired, AIRBUS France

Accounting: Francis RENARD, retired, AIRBUS France

Honorary President: Jean-Michel DUC, retired, DGA

Honorary Member: Patrick TEJEDOR , AIRBUS Central Entity

Members: Michel AGUILAR, Pierre-William BOUSQUET, Jean-Luc CHANEL, Pierre CONFORTI, Gregory COURBATIEU, Klaas DIJKSTRA, Marie FROMENT, Denis GALL, Delphine GOURDOU, Yves GOURINAT, Jacques HUET, Jean-Francois IMBERT, Marc LABARRERE, Gerard LADIER, Philippe LANDIECH, Paul LEPAROUX, Laurent MANGANE, Olivier MARTY, Jean-Claude RIPOLL, Carole ROMBOLETTI, Manola ROMERO, Etienne ROUOT, Jean-Jacques RUNAVOT

Salaried sectetary: Joelle STELLA

Upper left: Alice Torgue and Francis Guimera, newly elected President of AAAF TMP as of June 2009

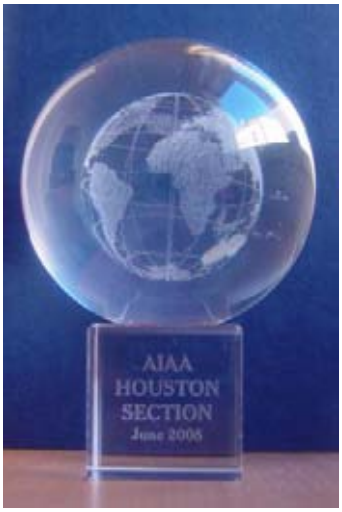
Upper right: Beatrice Cartier -Yazell, Alain Chevalier, past President (he served for about five years in a row in that role), and Philippe Mairet, newly elected or re-elected Secretary.

Bottom: Etienne Rouot, Marie Froment, and Douglas Yazell.

Pictures are from June 2008 Yazells' sister section visit to Toulouse, France, in June of 2008 at the Airbus facility. (Photos by Douglas Yazell)

Left to Right: Philippe Mairet, Michel Bonavitacola, Douglas Yazell, and Laurent Mangane in June 2008 in Toulouse, France, at La Cite de l'Espace, in front of a Mir mockup purchased from Russia. (Photo: Beatrice Cartier-Yazell)

One of three gifts of this type from our section to members of our French sister section in June of 2008. The sphere sits in a depression on the top of the base cube. When we spin the sphere by hand, we see the globe turn, and the larger glass sphere appears to be motionless. This is from Awards of Distinction in Houston's Clear Lake area. (Photo: Yazell)



OASIS: Outpost for Advanced Confinement Simulator Infrastructure

One of the working groups of our French sister section AAAF TMP is OES, the Observation and Exploration of Space, currently led by Mr. Pierre Conforti. An exciting project related to their volunteer work is OASIS, the Outpost for Advanced Confinement Simulator Infrastructure. The following is a translation of their informational brochure:

I. Space Competition

In 2006, the Americans announced their intention to return to the Moon for a near-Earth test of a mission sending people to Mars. This decision is due to the desire on the part of the Americans to maintain their pre-eminence in space, but also to the possibility of mining Helium-3, a phenomenal source of clean energy. This energy source tempts all nations, notably China, who anticipates a Lunar base between 2020 and 2030.

Americans and Russians alone are not enough to finance 200 billion dollars for this Lunar exploration. An implicit sharing arrangement has presented itself: heavy launchers for the Americans and the Russians, and ~~"~~the rest" is left for other space agencies. In this remaining part is found an indispensable tool: the confinement simulator without which Moon and Mars bases would be impossible.

~~"~~When the United States, China, and India possess their permanent installations on the Moon, will Europeans forgive their leaders for having failed to accomplish this task, which will reinforce confidence in the future and will lead to new advanced technologies and other major scientific discoveries?" (French Parliament, February 2007, Mr. Cabal and Mr. Revol.)

II. The Integrated Confinement Simulator

The European Space Agency (ESA), in the framework of extra-terrestrial exploration programs FIPES and AURORA, finished the first

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studies (phase A) for the development of a confinement simulator. Phase B will be launched soon in the form of a competitive dialog.

MEDES (CNES) and Thales studied the approximately 20 existing and specialized confinement simulators. This specialization limits research and development and prevents diversification of potential ~~-u~~sers". This French study quickly put together an inventory of non-space applications conducted in a new kind of simulator, multi-function or integrated confinement simulator.

III. A Major Economic Interest

The installation in Europe of the integrated confinement simulator will lead to, for this century, a major technological upset equivalent to the first days of the world's space programs or to the development techniques of telecommunication thanks to European research and European industry.

This major tool will reinforce the position of the European space sector, today facing competition from emerging nations which want very much to welcome this infrastructure.

IV. Survey of Non-Space Applications

- Health: major sanitary risks are associated with confinement, for example during habitation of giant towers of the future, especially for:

– The relation between certain cancers and the lack of physical activity, the reduction of light, the disappearance of objective points of reference
– The circadian cycle
– Obesity
– Stress
– Iatrogenic illnesses (caused by hospital stays, doctors, drugs or medical procedures) and their propagation
– The study of microbial flora between individuals
– Perturbations in nycthemeral (daily) rhythms
– Proliferation of micro-organisms and the exchange of resistance genes
– Easily bringing laboratories online (P3/P4)

- Civil Safety: thanks to the integrated confinement simulator, research and training can be done with:

– Enclosed decontamination environments
– Management of crisis situations (terrorism, firefighters, caves, etc.)
– Validation of protective spacesuits and protocols for use
– Training of rescue teams, training for submarine teams, etc.

- Aeronautics: for long-haul flights (Airbus A380), the scenario in the integrated confinement simulator would study:
– Fatigue tolerance of equipment and travelers (vibration, light, noise, etc.)
– Ergonomics and comfort of the avionic habitat
– Recycling of water (reduction of the volume of water to take along leads to fuel savings and more autonomy)
– The Environment
– Survival in an enclosed world (air, water, food)
– Oxygen factory, inert gas, light, temperature, hygrometry (measurement of atmospheric humidity), pressure
– Recycling and management of used water and trash
– Evolutionary study of antibiotic metabolites, medications, or toxins
– Simulations of closed ecological systems
– Bio-production: reconstruction of the food chain in an isolated world, notably:
– During exterior contamination (for example, Chernobyl, natural catastrophes, nuclear catastrophes, etc.)
– In case of required autarky (political self-rule when the government controls the economy and isolates the nation), for example, missions to the Earth's poles, space missions, etc.
– Hydroponic farming (climate change, deserts, etc.)
– Transgenic studies without risk of dissemination
– Production of vegetable proteins, monomers, fibers, food with medicinal properties, fish farming, etc.

- Energy: life in an enclosed world necessitates an autonomy of energy. The integrated confinement simulator would allow improvement in output, storage and recuperation of certain energies:

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- Solar energy
- Biomass
- Oxygen and hydrogen
- Nuclear energy

- University training: this integrated confinement simulator will create:
- New degree courses
- An increase in the number of publications and theses
- An improved international reputation for universities and schools in the Midi-Pyrenees region of France

V. Survey of Space Applications

The confinement simulator will allow, during long periods, for a team of a dozen people:

- Learning to live in an autarky (political self-rule and government economic rule for isolated nations) in a closed world
- Execution of extravehicular excursions
- Training
- Testing and perfecting new materials and procedures (rovers, equipment, etc.)
- Taking advantage of non-space research and applications being conducted simultaneously

VI. Scientific Tourism

Around the infrastructure of the integrated confinement simulator, a park or a permanent exposition will be charged with:

- Organizing international scientific conferences
- Creating playful and educational attractions directed to the lay public but also to scholars and students
- Development of tourism
- Promotion of European technology to attract job-supplying companies

VII. Support for the Simulator

- The European Space Agency (ESA)
- NASA
- The Russian Space Agency
- The DLR (The German Space Agency)

All of these support the project of this integrated simulator.

ESA, NASA and the Russian Space Agency have confirmed their intention to use the integrated confinement simulator to train their teams of astronauts and cosmonauts with a view to voyages of extra-terrestrial exploration.

That will correspond to about 60% of the potential use of the simulator. The remaining 40% will be covered by non-space applications.

VII. Financing

To finance feasibility studies, a European consortium was created to apply for the granting of regional, national, and European subsidies.

Since Europe is late in joining in the development of life sciences and planetary exploration, and due to the impact of recent decisions taken around the world, the support of all parties and proper financial support is required to avoid placing the integrated confinement simulator OASIS outside of Europe.

The integrated confinement simulator OASIS is one of the last chances for Europe to rejoin the leading group of spacefaring nations.

~~–~~OASIS is also a tremendous organizing program for the future of Europe related to research, teaching, and the economy."

Sidebar ending the text:

This integrated confinement simulator will contribute to future extra-terrestrial exploration. Like the start of the past century, one of the most beautiful eras in history would be written by Europeans, as in the age of the invention of airplanes, air mail, the Ariane rocket, the SPOT satellites, HELIOS, and many more inspiring results of those who dreamed of the impossible.

Below: Ariane 5 satellite launcher rocket and cite de l'espace space center, Toulouse, France (picture from brochure)

AAAF Brochure

Shown below is a translation of the brochure for the OES working group organized by our French sister section in Toulouse, France.

3AF
Association Aéronautique Astronautique de France

Groupe régional Toulouse-Midi-Pyrénées
Résidence 2 - 10 av. Edouard Belin - 31400 Toulouse

Working group

Space Observation and Exploration

Objectives

- Follow and share current events

- Prepare articles for la Gazette, the newsletter of 3AF Toulouse – Midi-Pyrénées (TMP)

To join us

As a member of 3AF, you would like to interact with others and express yourself on subjects related to the observation and exploration of space (both human and robotic), so…

Contact us

Pierre CONFORTI :
pierre.conforti@thalesgroup.com

Philippe MAIRET :
philippe.mairet@airbus.com

Who are we?

L'Association Aéronautique et Astronautique de France (3AF) is a scholarly professional society in the service of aeronautics and space as well as military.

3AF collects and sends to its members the most recent scientific and technical results.

One special calling for 3AF is promoting the activities and skills of its institutions and agencies to worldwide audiences.

Being a driving force for community activities, the technical committees reunite the best experts in aerospace, thereby encouraging the emergence of new technologies, as well as new directions for research and development.

Examples of subjects tackled

ISS

Astronaut selection and training

Astronaut protection (against solar and cosmic radiation, ionizing radiation…)

Space medicine (general, psychological…)

Crewed space vehicles (Orion, Altair…)

Life and work of astronauts in space

The Moon and the planets of the solar system

Topographical and lighting studies, soil studies, seismology (Moon…)

Life science research, (Mars…)

Civil space observation (from Earth, from ISS, from the Moon…)

Lunar outpost :
- Environmental control required for astronauts
- Waste and sewage treatment

The benefits of the conquest of space for science, technology, society and the world of knowledge.

Lunch and Learn

A Lunar Surface Rendezvous Architecture Proposal

STEVEN EVERETT, EDITOR

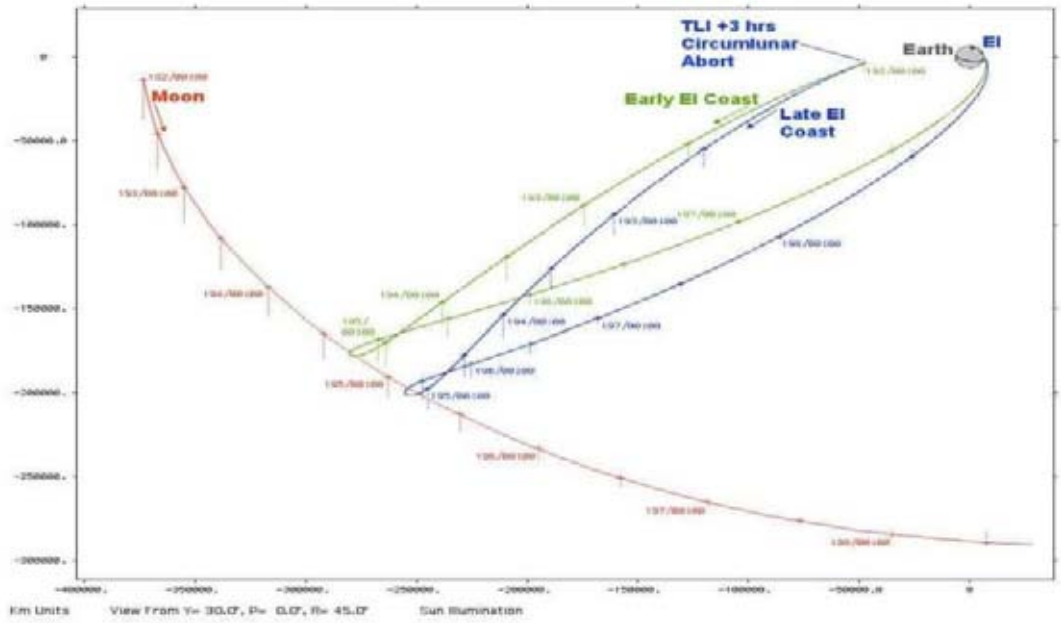
Above: Daniel Adamo presents his architecture proposal at the 2009 Annual Technical Symposium.

This Lunch and Learn event hosted by our local chapter was held in Building 16 at Johnson Space Center on June 12 to a crowd which rapidly grew to over 40 spectators. Douglas Yazell opened the meeting and Technical Committee chair Dr. Al Jackson introduced the speaker, Daniel Adamo. Mr. Adamo worked at JSC from 1979 to 2008 as a contractor, and, beginning in 1990, as a Flight Dynamics Officer (FDO). Since his retirement in 2008, he has been involved in astrodynamics research and consulting . This event allowed Mr. Adamo to expand on the brief introduction to his proposal for a Lunar Surface Rendezvous (LSR) architecture for returning to the Moon, as originally delivered at the 2009 Annual Technical Symposium on May 15.

After a review of his agenda, he stressed that his approach was driven by the ~~"l~~and anywhere, leave anytime" philosophy (which he noted was subject to change based on the results from the Augustine Commission.) According to this approach, an initial Ares V launch would deliver supplies directly to the Lunar surface with a vehicle he termed a Return Consumables Module (RCM). A subsequent launch, also with the Ares V rocket, would loft the manned vehicle, a combined Crew Exploration Vehicle/Descent Module (CEV/DM), to the surface in the vicinity of the RCM. The modified CEV would also act as the ascent stage and would comprise the only habitable volume in the system. The Lunar orbit rendezvous would be eliminated from the Constellation 1.5 architecture, while a technically challenging refueling would be required on the Lunar surface. However, he claimed that the nearly two week period between launch and Lunar landing currently required would be reduced to less than four days and also allow a return to Earth at anytime within four days. A variety of abort scenarios were described as well, including burns to return to Earth shortly after Trans-Lunar Injection (TLI) and rescue missions in which a second CEV would rendezvous with the original vehicle on an escape trajectory. The increased capabilities provided by the Ares V launch would also allow visits to Near Earth Objects (NEO) and even the moons of Mars.

Mr. Adamo graciously encouraged questions and comments from the audience after his talk, during which he clarified some of the concepts he presented and discussed some of the risks identified by this proposal. He has published a white paper which describes this concept further, and which he will be happy to provide upon request at adamod@earthlink.net.

Below: Two solutions for abort trajectories at 3 hours after trans-Lunar injection burn.



A New Way to Stay in Touch

STEVEN EVERETT, EDITOR

If you've kept up with the latest Internet trends, you've no doubt heard of some of the many new social networking sites. These sites allow members to find and stay in touch with friends through bulletin board-type posts or real-time chats; to post photos, videos and other links; or to participate in various discussion groups. While many of these are primarily used by the younger generation, Facebook has reported that its fastest demographic consists of those 35 years and older.

Now the AIAA-Houston chapter is trying out this resource as another means of communication among our members. A group has been established on this site to allow members to receive notifications of upcoming events or to discuss topics of interest.

Anyone can get an account on Facebook by signing up at http://facebook.com. You can join our chapter group by searching for "AIAA - Houston Section" or by invitation from a current member. The group is being moderated by Dr. Gary Turner (collegecoop@aiaa-houston.org) and Michael Frostad (see the Facebook page for contact information). Email them for additional help.

Staying Informed

COMPILED BY THE EDITORIAL STAFF

The Augustine Committee for the Review of U.S. Human Spaceflight Plans
http://www.nasa.gov/offices/hsf/home/index.html

Space 2.X: The Private Rocket Race Takes Off (Wired Magazine)
http://www.wired.com/wiredscience/2009/06/gallery_spacex/

Rebuttal of NASA's October 2007 Direct 2.0 Analysis Findings (18 May 2009)
http://www.directlauncher.com/documents/DIRECT_Analysis_Rebuttal_Final_090518.pdf

Lunar Reconnaissance Orbiter Home Page
http://lunar.gsfc.nasa.gov/

Lunar Orbiter Image Recovery Project
http://www.nasa.gov/topics/moonmars/features/LOIRP/

Personal Spaceflight
http://www.personalspaceflight.info/

HubbleSite
http://hubblesite.org/

Kibo Japanese Experiment Module
http://www.nasa.gov/mission_pages/station/structure/elements/jem.html

U.S. Aerospace Trade Surplus Grows ...
http://blog.seattlepi.com/aerospace/archives/170381.asp?from=blog_last3

Delays in Planning Could Cost Aerospace Jobs (Chronicle, Brewster Shaw)
http://www.chron.com/disp/story.mpl/space/6432239.html

The Critical Need for Increased IT Education in Aerospace Undergraduate and Graduate Programs
http://www.personal.psu.edu/lnl/papers/aero_IT_2009.pdf

LPI Lecture

A New Light on the Moon

ALAN SIMON, ASSISTANT EDITOR

Above: Paul Spudis, expert in planetary geology and remote sensing at the Lunar and Planetary Institute

Just five years ago, President George W. Bush announced his Vision for Space Exploration (VSE) that chartered a new course for US space policy, and a change in direction for human space exploration. Accordingly, NASA's Constellation Program (CxP) set as its major goals gaining significant experience in operating away from Earth's environment, developing technologies needed for opening the space frontier, and conducting fundamental science. Currently, NASA is designing—at the speed of its funding—a host of spacecraft and booster vehicles in order to replace the Space Shuttle and to send astronauts back to the Moon. But, is our target the right one, and is the course appropriate? Why go back to the Moon?

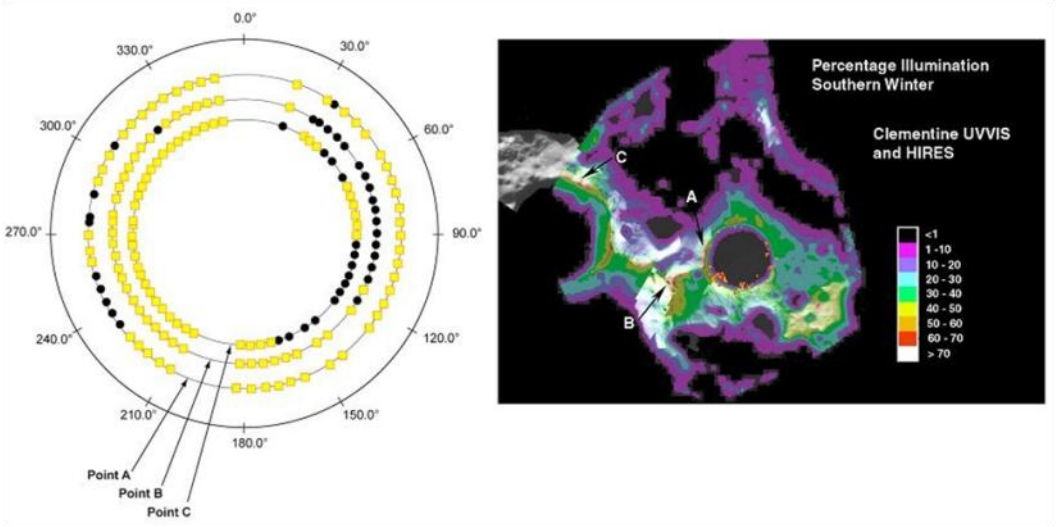
Perhaps in a few months, answers to some of these questions may be available. Norm Augustine, a retired CEO of Lockheed Martin, was recently commissioned by President Barack Obama to chair a committee that will study the CxP and recommend how best to send human explorers beyond Low Earth Orbit (LEO).

In the mean time, many experts today maintain that the Moon is the most appropriate satellite to explore; and their reasons are many. In fact, these reasons were made compelling during a lecture that Dr. Paul D. Spudis delivered at the Lunar and Planetary Institute, on April 23, 2009: A New Light on the Moon.

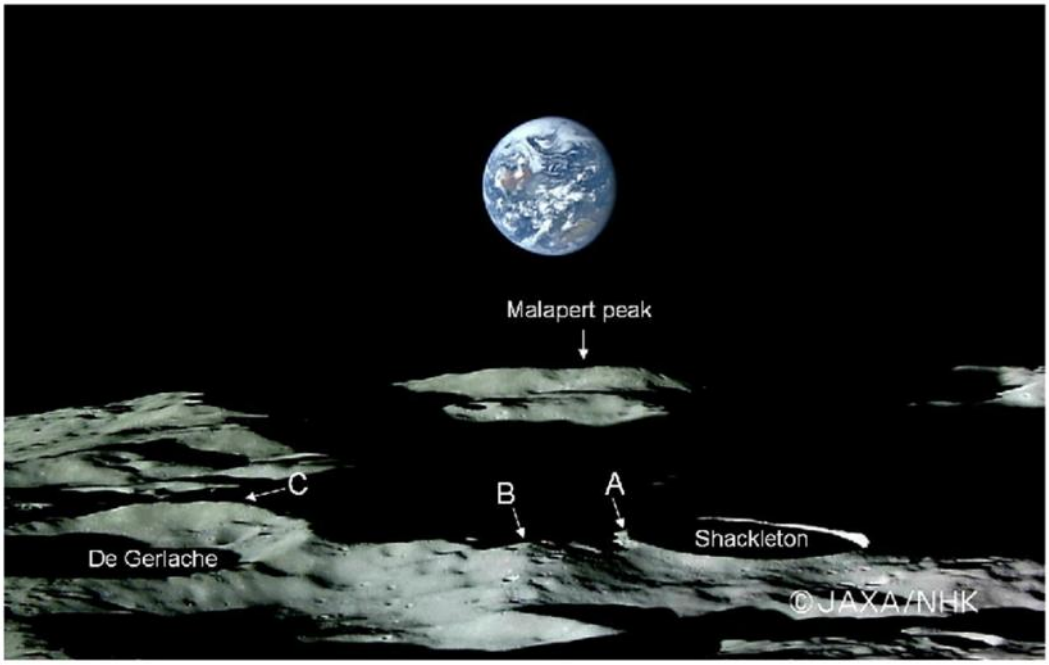
NASA has already sent people to the Moon and returned them as well as a considerable number of geological specimens safely to Earth. So, why not set our sights on Mars, or maybe even a nearby asteroid? Well, for one reason, the Moon is relatively close—only about 240,000 miles away—and it can be reached within about three (Earth) days. Compare that distance with Mars, and the increase can be more than 100 days. Because of Mars' elliptical orbit, Earth passes Mars (opposition) once every 26 months. So, to limit the forward and return Mars trip distances, launch windows are constrained, as well as mission durations. The Moon's orbit is also elliptical. But the change in distance from the Earth is small, and always makes for a relatively short duration trip.

Okay, so getting to the Moon is quick and easy. But, is there anything worthwhile once a crew is there? Dr. Spudis contends that the Moon is as interesting as it is

(Continued on page 31)



Right: Graphic illustrating lighting at the Lunar south pole around Shackleton Crater.



Left: HDTV images from Kaguya satellite confirming inferences from Clementine and SMART-1 images on sunlit peaks in region.

(Continued from page 30)

useful. While, to the casual observer, the Moon may appear dead and pointless, it holds a latency of science, inspiration, and resources. Because the Moon has no atmosphere and no climatology effects, each impact crater represents a record of planetary history. And as close as the Moon is to Earth, we can be assured that whatever collided violently with the Moon—now marked for eternity on its surface—also collided with Earth, though our living planet may have deviously covered up the crime scene. The Chesapeake Bay Crater, for instance, only recently discovered in 1983, covers an area twice that of Rhode Island and nearly as deep as the Grand Canyon. However, millions of years of time passage have allowed much of it to be filled with sediment today. The forensics of that impact is almost completely a blur.

So, the Moon holds planetology information that is relevant to the Earth. And because the surface is bathed in solar wind particles and cosmic rays, the regolith (Moon dust) holds information relative to the Sun as well. The Moon's surface is a complex crust, filled with volcanic material that, over the years, has seen very little erosion. Therefore, the regolith contains the recorded history from millions of years ago.

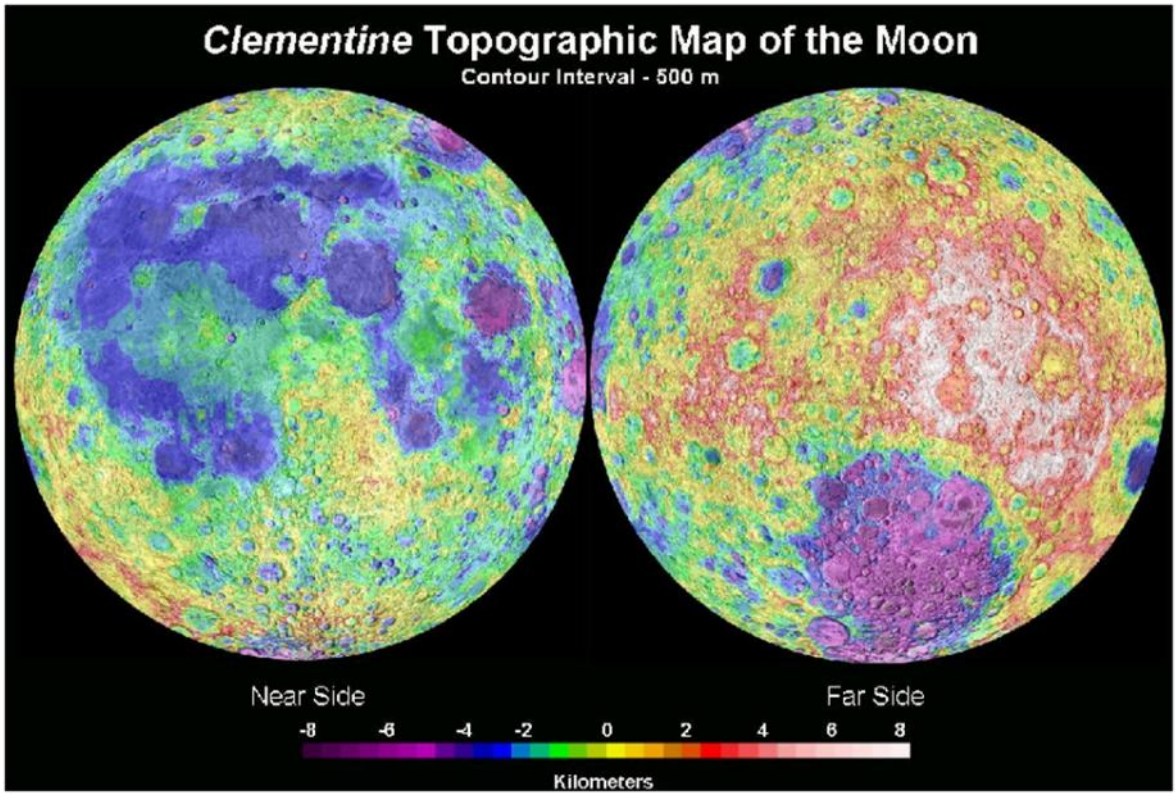
Interestingly, most Lunar impacts occurred about four billion years ago, about the time that life is believed to have started on Earth. Very likely, whatever hit the Earth back then also impacted the Moon, and the impact data is still preserved to this day.

The Hubble Space Telescope (HST) recently was made anew by the Atlantis crew of STS-125, and astronomers and laypeople alike are excited about the potential of new discoveries. Science classrooms across the US (and other countries) are adorned with amazing photographs of HST images—some beyond the most talented artists. But the HST, like many telescopes, has limitations because of the environment its instruments operate in. The far side of the Moon, however, offers a very stable surface for a future telescope that would be shielded from the radio spectra from Earth. And data transmission would still only be on the order of a few seconds.

Dr. Spudis claims the Moon is also a logical step in our evolution of exploration. It provides a stepping stone for human exploration to the other bodies in our solar system. It offers a place to learn how to successfully live and work away from our own planet. It is a school for exploration.

The Moon also holds an abundance of critical resources, too, that will be needed to make our way to distant satellites. The surface likely holds abundant caches of water ice. We know today that it holds oxygen (O_2), and metals and others materials, such as aluminum (Al), iron (Fe), and hydrogen (H_2), as

(Continued on page 32)



Above: Clementine topographic map of the Moon.

(Continued from page 31)
well as solar wind gases, and solar energy particles.

The Lunar poles contain some of the largest and oldest impact craters (particularly the South Pole). These areas have unique environments that may have resulted in unique and complex processes. For instance, the Shackleton Crater floor has been in darkness for more than 3.5 billion years. That area behaves as a cold trap, whereby temperatures hover below 100° Kelvin, and particles cannot escape. These cold traps could hold additional planetology data that has been preserved for billions of years. In contrast, the Clementine spacecraft, flown to complete the complex task of mapping the Moon, has found areas on the surface that are almost always in sunlight.

The Miniaturized Synthetic Aperture Radar (MiniSAR), developed by Sandia National Laboratories, is currently mapping the Lunar surface, including the poles. The Mini-SAR imaging radar, which is aboard the Indian Chandryaan-1 spacecraft, has been sending back amazing images for the last couple of months. Radio waves do not need visible light illumination, and therefore, imaging can occur continuously. The radar backscatter signature is quite useful in determining the presence or absence of water ice. Although ~~–e~~ureka" has not yet been declared, radar images have confirmed geological interpretations that were first derived in 1994 from Clementine images.

To leverage the Mini-SAR findings, India and the US plan to synchronize their efforts using a payload aboard the US Lunar Reconnaissance Orbiter (LRO). The LRO is planned to be launched in June 2009, and it will exchange data with a Chandrayaan-1 payload. The LRO mission will focus on the little-known Lunar poles, searching for H_2 accumulations and water-ice that are not present at the equatorial regions—the area Apollo crews explored some 40 years ago. What is so important about finding water ice in the Polar Regions? Water is an ideal commodity for a source of rocket propellant. And the mining and processing of propellant could then allow access to Earth geosynchronous satellites, making servicing missions much more cost effective. It could also allow fueling of future exploration vehicles, eliminating the need to escape the gravity of Earth.There are H_2 deposits contained in the Lunar regolith as a result of solar wind bombardment. However, extracting the solar wind hydrogen requires heating the Lunar material to around 700°C, making extraction from water ice much more favorable.

Dr. Spudis continues to argue for the benefits of a Lunar settlement over sortie missions to the Moon because an outpost will permit and enable more exploration over the long run. He blogs for *Air & Space Magazine*. More information can be found at http://www.lpi.usra.edu/lpi/spudis/.

Recollections on the Apollo Lunar Lander

Cover Story

CAPT. ANDREW HOBOKAN AND DOUGLAS YAZELL, ASSISTANT EDITOR

Apollo 11 Lunar Module: Why Eagle?

Hobokan was in his office in Bethpage, New York, as the NASA Resident Apollo Spacecraft Program Office (RASPO) Manager when Werner von Braun arrived for a meeting. To Hobokan's surprise, George Low was also in town for that meeting with the three of them. They wanted to select the Lunar Module (LM) to be used in the first Moon landing. LM-3 or 4 through LM-7 were available.

As George Low was addressing requirements to be met before he would commit to a landing attempt, he made a few comments regarding backup requirements if we had a problem in the early flights of the LM. At one point, von Braun shouted at Low, saying something to the effect, "Backup, backup, backup! You JSCs want a backup for everything. At some point, you must make up your mind and launch!"

George Low asked me how much time KSC said they needed to process a LM. When I told him they keep saying 3 months, but they have never had a full-up LM and no manned LM had been in orbit up to that time, he insisted we give KSC 4 months to be safe, and that put LM-7 too late to be considered. That narrowed it down to LM-5 and LM-6 because LM-4 was too heavy. George Low finally told Werner that we should work internally to do it with LM-5 if everything went well, but we should tell the outside world, including the press and Grumman's work force, that LM-6 was chosen.

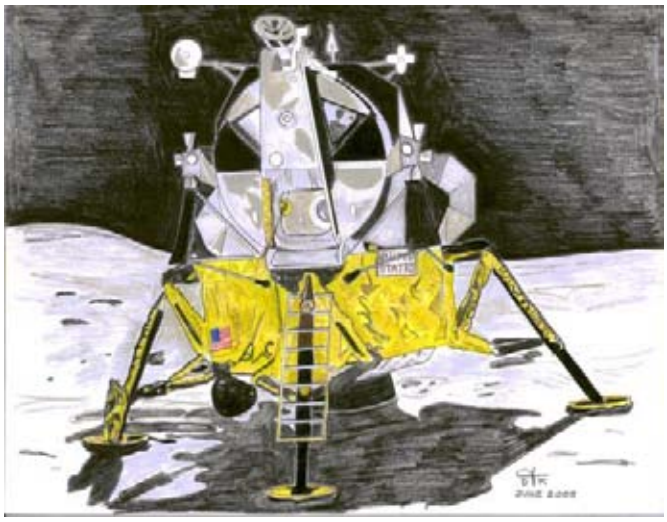
Gold on the Inside of the Gemini Adapter

Hobokan had the Resident NASA Contracting Officer approve a McDonnell purchase order for several cans of gold dust from Fort Knox for use on the Gemini launch adapter which housed the fuel cells and the liquid hydrogen and the liquid oxygen tanks. McDonnell had done a lot of analyses which said it needed a coating with a special property measured at 0.01, and 0.1, for example, would never be good enough. They had decided that only gold would work and submitted the purchase request to the Resident Office.

When Robert Gilruth heard about it and the price of the gold dust, he called Hobokan and shouted at him in anger, but he never cancelled the order. Hobokan and others ran their fingers through the dust once it arrived. It's a very unique material with a strange feeling as it runs between the fingers. Application instructions included warnings to never apply more than one coat because there was evidence that the subsequent coat would not adhere properly. Once the job was done, it measured 0.1!

Hobokan was called to Houston to explain to the Project Manager about fixing the problem or explaining the failure related to such high monetary costs. During a plane change stop in Kansas, Hobokan called the resident team and told them to have McDonnell apply a second coat, despite the instructions to the contrary.

McDonnell applied the second coat, and the result was as McDonnell engineering had specified. McDonnell found that the first coat was too thin, and the measurement was reading a value related to the white epoxy undercoating. The good news was transmitted to Houston before Hobokan's arrival and he was no longer on the meeting agenda.



Left: Apollo Lunar Excursion Module (illustrated by Don Kulba, assistant editor)

Calendar

Be sure to check out the Facing Mars exhibit at the Houston Health Museum
1515 Hermann Drive
Houston, TX 77004
713-521-1515
info@thehealthmuseum.org

July 1
Start of the new AIAA year

July 18
Fly Me to the Moon
Saturday, starting at 6:00 PM (This is not an AIAA event)
A free Community Celebration of the First Lunar Landing (Apollo 11)
University of Houston-Clear Lake (UH-Clear Lake)
Alumni Plaza, Liberty Park
http://prtl.uhcl.edu/portal/page/portal/ALR/flyme/lunar_landing/event_info.html

UHCL Office of Alumni and Community Relations 281-283-2021
Recapture the magic, the music and the memory of the moment that marked our Bay Area Houston community. Enjoy a 1969 family-style picnic, an outdoor viewing of the first Lunar landing on a giant inflatable screen, stargazing with telescopes guided by astronomers, live entertainment, interactive games and activities for all ages, special NASA guests and speakers, space-related giveaways and more.

August 6-7
AIAA Regional Leadership Conference (RLC)
Colorado Convention Center
Denver, Colorado

August 22
AIAA Houston Section Leadership Retreat
After the AIAA Regional Leadership Conference (RLC)
Using notes from the RLC as one of our planning resources

September 7
Council meeting
secretary@aiaa-houston.org
281-244-3925 (Past Chair)
Probably at Gilruth Center, San Jacinto Room, NASA/JSC
5:30 to 6:30 pm

September 30
September 2009 Horizons due online (www.aiaa-houston.org/horizons)

Facing Mars exhibit closes
The Health Museum
www.thehealthmuseum.org

Horizons published quarterly, online late March, June, September and December.
See http://www.aiaa-houston.org/horizons

EAA Corner

EAA Chapter 12 Officers for 2007-2009:
President: Richard Sessions, rtsessions@earthlink.net
Vice President: Phil Perry, VicePresident@EAA12.org
Treasurer: Terry Ford, Treasurer@EAA12.org
Secretary: Terry Ford, Secretary@EAA12.org
Young Eagles: Dean Doolittle, YE@EAA12.org

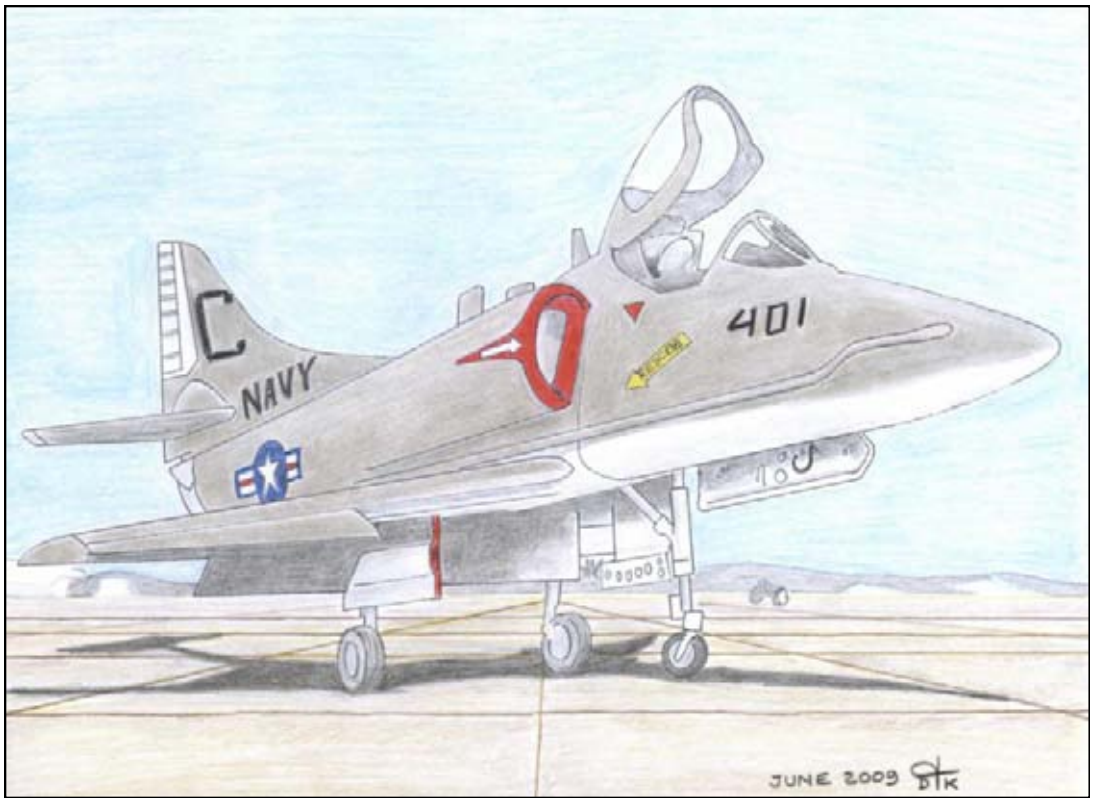
EAA Chapter 12 Meetings for 2009:

Future Meeting/Event Ideas: Others - Young Eagles, LSA, Alternate Engines, Fly-ins,….
Ideas for or want to give a meeting? Contact Richard at rtsessions@earthlink.net

Scheduled/Preliminary Chapter 12 Event/Meeting Ideas:
01 July 09 - Builder's Visit - Recently completed RV or canard?
05 Aug 09 - Aircraft Antennas – Lance Borden
02 Sep 09 - LaBiche Flying Car (still need to ask) - www.labicheaerospace.com/
3-5 Dec 09 - EAA Foundation's B-17 Aluminum Overcast in Houston

EAA Chapter 12 Home Page: http://www.eaa12.org/
EAA National Home Page: http://www.eaa.org/

Above: The new airplane in the collection of Richard Sessions (his second plane now hangared at Ellington), a LongEZ shown here at Aeros and Autos on Saturday, May 9, 2009, at Ellington Field.



Left: Navy Skyhawk (illustrated by Don Kulba, assistant editor)

Conference Presentations/Articles by Houston Section Members

COMPILED BY THE EDITORIAL STAFF FROM AIAA AGENDAS

45th AIAA/ASME/SAE/ASEE Joint Propulsion
2 - 5 Aug 2009
Colorado Convention Center, Denver, CO

AIAA-2009-4897
Space- Based Solar Power Prototypes Enabled by a Heavy Lift Launcher
W. Rothschild and T. Talay, John Frassanito & Associates, Inc., Houston, TX; and E. Henderson, NASA Johnson Space Center, Houston, TX

AIAA-2009-4899
On-Orbit Propulsion and Methods of Momentum Management for the International Space Station
R. Swanson, The Boeing Company, Houston, TX; V. Spencer, S. Russell and K. Metrocavage, NASA Johnson Space Center, Houston, TX; U. Kamath, The Boeing Company, Houston, TX

AIAA-2009-4951
High Performance Multilayer Insulation for a Liquid Oxygen / Liquid Methane Reaction Control System
B. Lusby, S. Flores, E. Hurlbert, K. Romig, and J. Collins, NASA Johnson Space Center, Houston, TX

AIAA-2009-4948
Sea- Level Flight Demonstration and Altitude Characterization of a LOX/LCH4 Based Ascent Propulsion Lander
J. Collins, NASA Johnson Space Center, Houston, TX

AIAA-2009-4949
Liquid Oxygen / Liquid Methane Test Results of the RS- 18 Lunar Ascent Engine at Simulated Altitude Conditions at NASA White Sands Test Facility
J. Melcher, NASA Johnson Space Center, Houston, TX; and J. Allred, White Sands Test Facility, Las Cruces, NM

AIAA-2009-5161
Flow Characterization of a New Particle- Impact Ignition Facility
M. Crofton, Aerospace Corporation, Los Angeles, CA; E. Petersen, Texas A&M University, College Station, TX

AIAA-2009-5359
Exhaust Plume Measurements and Momentum Flux Results of the VASIMR VX- 200
B. Longmier, University of Houston, Webster, TX; E. Bering, University of Houston, Houston, TX; J. Chancery, L. Cassady, J. Squire, and F. Chang-Díaz, Ad Astra Rocket Company, Webster, TX

AIAA-2009-5360
Plasma Behavior in the Far Plume Region of a VASIMR Engine
W. Chancery, Ad Astra Rocket Company, Webster, TX; B. Longmier, University of Houston, Houston, TX; L. Cassady, C. Olsen, and J. Squire, Ad Astra Rocket Company, Webster, TX

AIAA-2009-5362
VASIMR Technological Advances and Results of 200 kW Operations
L. Cassady, J. Chancery, J. Squire, and F. Chang-Diaz, Ad Astra Rocket Company, Webster, TX; B. Longmier, University of Houston, Houston, TX; and M. Carter, Ad Astra Rocket Company, Webster, TX

AIAA-2009-5391
Cryogenic Feed- System Thermodynamic Vent System Design and Test
J. Collins, NASA Johnson Space Center, Houston, TX

AIAA Guidance, Navigation, and Control
AIAA Atmospheric Flight Mechanics
AIAA Modeling and Simulation Technologies
10 - 13 Aug 2009
Hyatt Regency McCormick Place, Chicago, Illinois

AIAA-2009-5668
Integrated Guidance and Fault Tolerant Adaptive Control for Mars Entry Vehicle
M. Marwaha, B. Singh, J. Valasek and R. Bhattacharya, Texas A&M University, College Station, TX

AIAA-2009-5696
Generic Modeling Approach for Math Model Simulators
W. Davidson, United Space Alliance, Houston, TX

AIAA-2009-5699
Progress On and Usage of the Open Source Flight Dynamics Model, JSBSim
J. Berndt, JSBSim, League City, TX; and A. De Marco, University of Naples "Federico II", Napoli, Italy

AIAA-2009-5773
An Entry Trajectory Design Methodology for Lunar Return
Z. Putnam and G. Barton, Charles Stark Draper Laboratory, Inc., Houston, TX; and M. Neave, Charles Stark Draper Laboratory, Inc., Cambridge, MA

(Continued on page 37)

(Continued from page 36)

AIAA-2009-5801
Attitude Stabilization With Network Delay in Feedback Control Implementation
A. Chunodkar and M. Akella, University of Texas at Austin, Austin, TX

AIAA-2009-5849
Six Degree- of- Freedom Dynamical Model of a Morphing Aircraft
A. Niksch, J. Valasek, T. Strganac and L. Carlson, Texas A&M University, College Station, TX

AIAA-2009-5881
Nonlinear System Identification of Discrete Systems Using GlLOMap
M. Marwaha and J. Valasek, Texas A&M University, College Station, TX; and P. Singla, State University of New York at Buffalo, Buffalo, NY

AIAA-2009-5883
Using Frequency- Response Functions to Investigate String Stability of Cooperative Control Laws
L. Weitz and J. Hurtado, Texas A&M University, College Station, TX

AIAA-2009-5912
A Simulator for Modelling Aircraft Surface Operations at Airports
Z. Wood, NASA Ames Research Center, Moffett Field, CA; S. Rathinam, Texas A&M University, College Station, TX; Y. Jung and M. Kistler, NASA Ames Research Center, Moffett Field, CA

AIAA-2009-5927
Effects of Mass and Size on Control of Large Receiver in Aerial Refueling
A. Dogan, C. Elliott, and F. Riley, University of Texas at Arlington, Arlington, TX; and W. Blake, U.S. Air Force Research Laboratory, Wright-Patterson AFB, OH

AIAA-2009-5955
A Homotopy Method for Bang- Bang Control Problems
X. Bai, J. Turner, and J. Junkins, Texas A&M University, College Station, TX

AIAA-2009-5990
Optimal Nonlinear Feedback Control by Using Galerkin Approximation Techniques
R. Sharma, University of Alabama, Tuscaloosa, AL; S. Vadali, Texas A&M University, College Station, TX

AIAA-2009-5996
Automation Interfaces of the Orion GNC Executive Architecture
J. Hart, NASA Johnson Space Center, Houston, TX

AIAA-2009-6001
Perturbation Analysis for Optimal Interplanetary Trajectories
X. Bai, J. Junkins, and J. Turner, Texas A&M University, College Station, TX

AIAA-2009-6213
Optimal Perimeter Patrol Alert Servicing with Poisson Arrival Rate
P. Chandler and J. Hansen, U.S. Air Force Research Laboratory, Wright-Patterson AFB, OH; R. Holsapple, U.S. Air Force Research Laboratory, Wright-Pattersonn AFB, OH; S. Darbha, Texas A&M, College Station, TX; and M. Pachter, Air Force Institute of Technology, Wright-Patterson AFB, OH

AIAA-2009-6104
An Autonomous Onboard Targeting Algorithm Using Finite Thrust Maneuvers
S. Scarritt and B. Marchand, University of Texas at Austin, Austin, TX; and M. Weeks, NASA Johnson Space Center, Houston, TX

AIAA-2009-6250
A Generalized Dynamic Programming Approach for a Departure Scheduling Problem
S. Rathinam, Texas A&M University, College Station, TX; Z. Wood, B. Sridhar, and Y. Jung, NASA Ames Research Center, Moffett Field, CA

AIAA-2009-6254
Robust Air- Traffic Control Using Ground- Delays and Rerouting of Flights
P. Dutta, R. Bhattacharya and S. Chakravorty, Texas A&M University, College Station, TX

AIAA-2009-6307
A Model Based Hierarchical Approach to Control Design for Morphing Dynamics
M. Kumar and S. Chakravorty, Texas A&M University, College Station, TX

AIAA-2009-6312
On Camera Calibration for Star Tracker Applications
D. Woodbury, T. Henderson and J. Junkins, Texas A&M University, College Station, TX

Joseph S. Algranti, 1925-2009

DOUGLAS YAZELL, ASSISTANT EDITOR

Above: NASA Chief Test Pilot Joseph Algranti

James C. McLane, Jr., called my attention to the recent death of a space program pioneer, Mr. Joseph S. Algranti. Mr. McLane was our section chair for our 1971-1972 year, as we can see in a document listing past section officers on the web page for our history technical committee (www.aiaa-houston.org/tc/history). Starting with the 1962-1963 year, our first few section chairs were Alan J. Chapman, W. Scott Royce, Charles B. Appleman, Phil Sansone, Dr. George M. Low (a late member who was associated with historic decisions related to Apollo 8 going to Lunar orbit instead of only to Earth orbit), Alec C. Bond, Jack C. White, Joseph G. Thibodaux (a local resident who recently became an AIAA Fellow, John Stap, Jr., James C. McLane, Jr., Dr. Ernest Kistler, Joseph S. Algranti (1973-1974), and then Dr. Leland A. Carlson. Only two other officers are listed in Mr. Algranti's council, Secretary Norman H. Chaffee and Treasurer Beverly A. Steadman. Coincidentally, May 6, 2009, was the date of a retirement tribute for Dr. Leland A. Carlson, ~~-~~after 40 years of dedicated teaching, research, and service in the aerospace engineering department (1969-2009)," at Texas A&M University. Our section's current history committee chair, Mr. Chester A. Vaughan, was our section's Vice Chair of Operations the year before Mr. Algranti served as our Chair and Mr. Vaughan served in that Operations role again 3 years later.

From the LaGrange, GA, Daily News:

~~-~~Joseph Samuel Algranti, 84, of LaGrange, died Wednesday, April 29, 2009, at Hospice LaGrange.

~~-~~Mr. Algranti was born February 8, 1925, in New York, son of the late Samuel Joseph Algranti and Beatrice Carol Algranti. He graduated from the University of North Carolina at Chapel Hill with a BS in Physics. He was a pilot in the U.S. Navy and retired as a Commander in the Naval Reserves. He began his career as a research test pilot in Cleaveland, OH at NACA. Next he moved to NASA at Langley, VA. From 1962, he assumed the role of Chief of Aircraft Operations and Chief Test Pilot at NASA in Houston, TX, where he was instru-

(Continued on page 39)

(Continued from page 38)
mental in the training of all aspects of the space program. He retired from NASA in 1992, and after retirement, he moved to Chapel Hill and then to LaGrange.

~~–~~Survivors include his wife, Annabelle Algranti of LaGrange; his children, Dr's Debbie and Richard Simmons of LaGrange, Samuel and Marilyn Algranti of Houston, TX, and Donald Alaster Cope of New London, CT; eight grandchildren, Andy, Pat, Anna, Stephanie, Joseph, Robert, Adrianne, and Nick."

Mr. Algranti was also a, ~~–~~Member, Quiet Birdmen," according to his biography from the NASA/JSC Oral History project (http://history.nasa.gov/alsj/Algranti-Bio.pdf). A quick internet search using Google hints that this is a private social group started in 1921 for very experienced pilots.

Various NASA web sites contain stories and photos of Mr. Algranti, and these are our main sources for this article. Mr. Robert Pearlman's web site, Collect Space (www.collectspace.com), contains an excellent article about Mr. Algranti at this address: http://www.collectspace.com/ubb/Forum38/HTML/001000.html.

From this web page, ~~–~~http://history.nasa.gov/SP-4009/v4p3b.htm", we find this quote:

~~–~~During a routine flight of Lunar Landing Training Vehicle (LLTV) No. 1, MSC test pilot Joseph S. Algranti was forced to eject from the craft when it became unstable and he could no longer control the vehicle. The LLTV crashed and burned. A flight readiness review at MSC on November 26 had found the LLTV ready for use in astronaut training, and 10 flight tests had been made before the accident. An investigating board headed by astronaut Walter M. Schirra, Jr., was set up to find the cause of the accident. And on January 8, 1969, NASA Acting Administrator Thomas O. Paine asked the review board that was established in May 1968 to restudy its findings on the May 6 crash of Lunar landing research vehicle No. 1 (LLTV-1).

~~–~~Memo, George E. Mueller, OMSF, NASA, to Acting Administrator, Manned Space Flight

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NASA Dryden Flight Research Center Photo Collection
http://www.dfrc.nasa.gov/gallery/photo/index.html
NASA Photo: E-14754 Date: 1 Apr 1966

Lunar Landing Research Vehicle (LLRV) 100th flight group photo

Above: Joe Algranti and others in front of the Lunar Lander Training Vehicle (LLTV)

(Continued from page 39)

Weekly Report - December 9, 1968,' Dec. 9, 1968; NASA Release 69-5, _Review Board Reconvened,' Jan. 8, 1969."

From this web site, ~~-~~http://history.nasa.gov/SP-4009/keyev4.htm," a note about Ellington Field is added:

~~-~~1968, December 8: Lunar landing training vehicle No. 1, with MSC test pilot Joe Algranti at the controls, crashed and burned at Ellington AFB, Tex. Algranti ejected safely."

This web page, ~~-~~http://history.nasa.gov/SP-4404/ch6-4.htm", contains a report no the feasibility of using liquid hydrogen as propulsion fuel for aircraft. The section of text on this web page carries a title, ~~-~~NACA Research on Hydrogen for High-Altitude Aircraft," and refers to 1950-1957, and a larger time period from 1945-1959. Mr. Algranti's name is mentioned 10 times in about 2,000 words on this web page, which concludes:

~~-~~On 13 February, 1957, the first of three successful flights was made and the fuel system worked well. The transition to hydrogen was made in two steps. The hydrogen lines were first purged, then the engine was operated on JP-4 and gaseous hydrogen simultaneously. After two minutes of operations on the mixture, Algranti switched to hydrogen alone. The transition was relatively smooth and there was no appreciable change in engine speed or tailpipe temperature. The engine ran for about 20 minutes on hydrogen. The pilots found that the engine responded well to throttle changes when using hydrogen. When the supply was almost exhausted, the speed began to drop. As this became apparent, Algranti switched back to JP-4 and the engine accelerated smoothly to its operating speed. The engine burning hydrogen had produced a dense and persistent condensation trail, while the other engine operating on JP-4 left no trail.

~~-~~On 26 April, Silverstein held a special conference to report what had been learned by the Bee project using hydrogen in flight. The 175 attendees heard 7 papers by 19 members of the project team. They covered hydrogen consumption, fueling problems, airplane tankage, airplane fuel system, and the flight experiments. The results were also given in a series of research reports published later.

~~-~~The first series of flights of the hydrogen-fueled B-57 was made with a helium pressurization system to force the liquid hydrogen from the wing-tip tank to the engines. This required a fairly heavy tank to withstand the pressure. Later, a liquid-hydrogen pump was developed which permitted a reduction in tank weight that more than offset the weight of the pump. Arnold Bierman and Robert Kohl developed the five-cylinder piston pump, driven by a hydraulic motor, for installation in the wing-tip liquid-hydrogen tank.

~~-~~Flight experiments with the pump extended into 1959. Three successful flights were made. Although the pump speed and discharge pressure varied, the hydrogen regulator maintained a constant engine speed during operation with hydrogen. All the transitions from JP-4 to hydrogen, burning hydrogen, and transition back to JP-4 were made without incident. The feasibility of using liquid hydrogen in flight had been thoroughly demonstrated."

From, ~~-~~http://www.nasa.gov/centers/dryden/about/Organizations/Technology/Facts/TF-2004-08-DFRC.html"

~~-~~From Research to Training

~~-~~All Apollo mission commanders and their backups flew many hours in the LLTVs before their Apollo flights. Their Lunar landing training also included a three-week helicopter flight school, training on the tethered Lunar landing simulator at Langley, and practice on the electronic ground simulator at the Manned Spacecraft Center.

~~-~~Nearly all of the Apollo astronauts offered high praise for the experience -- and confidence -- they gained from their LLTV flight time.

~~-~~As they gained this experience, the astronauts -- and also the instructor pilots -- learned to respect and be watchful of the complicated training machines. Out of the fleet of five, only two remain: LLTV A2, the No. 2 vehicle from Dryden, and LLTV B3. The other three were lost in training accidents, but fortu-

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nately all of the pilots ejected safely and uninjured.

–The most celebrated ejection was by Apollo 11 astronaut Neil Armstrong. On May 6, 1968, Armstrong was about 30 feet off the ground in LLTV A1 -- the No. 1 vehicle from Dryden -- when helium pressure in the propellant tanks failed and caused the attitude control system to quit. As the vehicle began pitching up and rolling, Armstrong ejected. The trainer fell to the ground and exploded.

–Seven months later, a Manned Spacecraft Center pilot, Joe Algranti, was flying LLTV B1 when gusty winds threw it out of control and he had to eject just seconds before it hit the ground.

–The last accident was on Jan. 29, 1971, when LLTV B2 was hit by an electrical system failure that knocked out the attitude control system. Instructor pilot Stu Present ejected while the vehicle crashed to the ground.

–The final flight in the LLTV program was on Nov. 13, 1972. The pilot was astronaut Eugene Cernan, who was wrapping up pre-launch training for the Apollo 17 flight that was carried out just one month later. It was the final Apollo mission to the Moon.

–The LLRV Legacy

–The staff at Dryden still looks at the LLRV development and research program as an excellent example of how individuals working in an aerodynamic environment can add a large measure of success to a spaceflight project through mutual cooperation and a complete understanding of differing engineering disciplines.

–The worth of the LLRV-LLTV program was realized during the final moments before Apollo 11 astronauts Neil Armstrong and Edwin "Buzz" Aldrin completed the first Moon landing in the LM named Eagle. As the two men were getting close to the Moon's surface, Armstrong saw they were nearing a rocky area. He disregarded the LM's automatic landing system and switched to manual control during the last moments of descent. Armstrong landed the LM on a safer, more suitable spot and was able to report, "Houston, Tranquility Base here...the Eagle has landed."

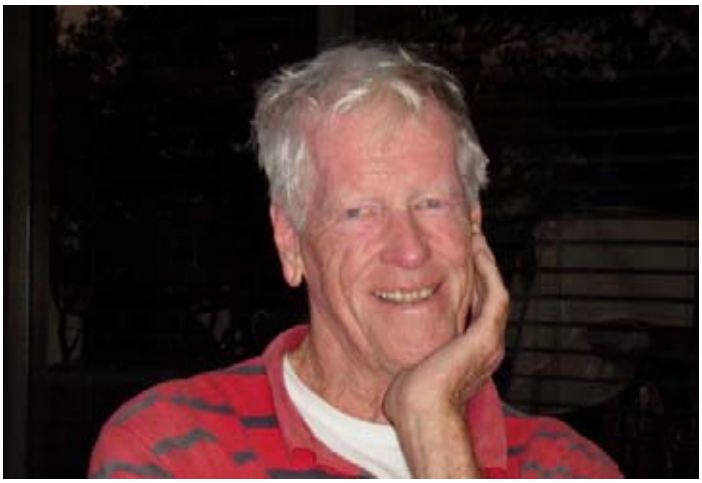
–Armstrong later said his practice flights in the LLTVs gave him the confidence to override the automatic flight control system and control Eagle manually during that epic Apollo 11 mission.

–LLTV A1, one of the two original research vehicles, was returned to Dryden where visitors can see it. LLTV B3, the last of the three training vehicles built, is on public display at the Johnson Space Center, Houston, Tex."

http://www.dfrc.nasa.gov/Newsroom/X-Press/stories/113001/ppl_baron.txt.html

Bob Baron, during his years working on the LLRV is second from left. From far left are Joseph Schneider, Baron, Jack Kleuver, Joe Algranti, Gene Matranga and Ron Bliley.

Richard P. “Dick” Edwards, 1933-2009

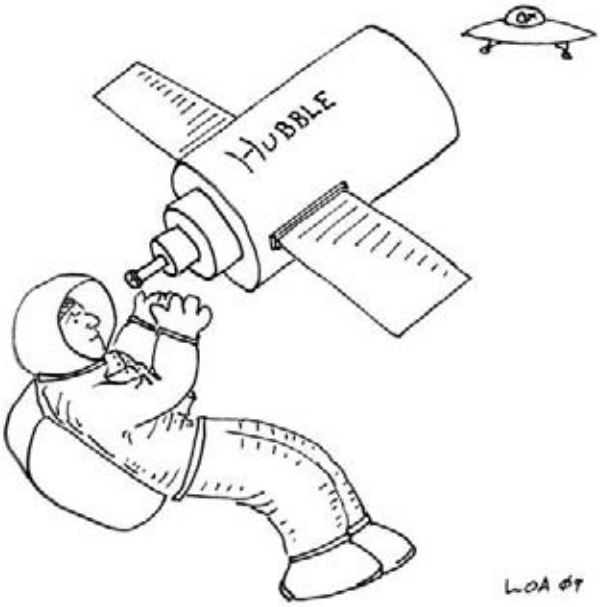


Above: Richard Edwards

Richard P. "Dick" Edwards was born October 17, 1933, in Madison, Wisconsin. He grew up in Madison, cultivating a passion for fishing until his family moved to Tucson, Arizona, when he was in high school. He distinguished himself in high school by lettering in four sports, then proceeded to the University of Arizona where he studied Mechanical Engineering and focused his sports interests on track and basketball. He earned a BS in Mechanical Engineering in 1956, and served as a pilot in the Air Force. In the 1960s he worked for several aerospace companies in Southern California, initially on the Atlas launch vehicle and later for Rockwell legacy company North American Aviation on the S-II stage of Saturn rockets that launched Apollo capsules to the Moon, then on 72/2, the first Rockwell satellite design. In 1980, he joined the Space Shuttle program for Boeing legacy company Rockwell International in Downey, California--which transferred him to Houston in 2002, and which he served in various capacities until his last day as a Principal Engineer in System Integration. One of his many notable accomplishments was co-authorship of a report to the President of the United States regarding implementation of engineering recommendations after the Challenger accident. His lifetime of service to crewed spaceflight was recognized with a Launch Honoree Award and Silver Snoopy. Throughout his life, he was involved in learning, earning a MS in Systems Engineering from UCLA in 1971, studying toward a Doctorate of Business Administration with United States International University in San Diego in the early 1980s, and Co-Founding Space Settlement Design Competitions for high school students in 1984. His volunteer service in Southern California included active membership and officer responsibilities in the American Institute of Aeronautics and Astronautics, engineering honor society *Tau Beta Pi*, and the Judging Policy Advisory Committee of the California State Science Fair. Space Settlement Design Competitions have grown to involve over 1000 students annually on six continents; Dick literally travelled around the world to help conduct Competitions for students. Dick also perpetually challenged his body and his mind with activities that changed throughout his life, including running marathons, accumulating sufficient Contract Bridge masterpoints to earn Life Master status several times over, snow skiing, hiking steep mountain trails, Grand Canyon raft trips, and sailboat racing. He started racing Ranger 23 "23 Skidoo" in the Southern California PHRF fleet in the early 1990s, engaged in one design racing on Cal 20 "P-C-H," and sailed "Trick Bag" in the J24 Texas Circuit and Wednesday Night Sailboat races. He is survived by his brother James "Jim" Edwards of San Diego, son Brad Edwards of Albuquerque, and loving wife of 23 years Anita Gale. He passed away suddenly at the tiller of "Trick Bag" near the front of the fleet in a Wednesday Night Sailboat Race on Clear Lake, near Houston, Texas. The family asks that in lieu of flowers, donations be made to the International Space Settlement Design Competition, c/o AIAA Orange County Section.

Right: A 2007 SSDC at NASA/ JSC Building 9, with high school students mostly from Iowa spending their weekend here (Photo: Yazell)

Congratulations STS-125 crew on a successful Hubble servicing mission!



Local speaker, writer and former JSC flight controller Marianne Dyson recently related a humorous story illustrating one young student's understandable misconception about the operation of the Hubble Space Telescope (HST). The question, which she relayed during a recent press conference and which was answered by astronaut John Grunsfeld, was whether the astronauts could look at objects through the telescope while carrying out the repairs. He answered that there is no eyepiece on the HST and that the "lens cap" was on during the mission! (Illustration by Horizons art contributor Louis Abney.)

Aerospace Projects Review

APR Corner

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APR Corner is presented by Scott Lowther, whose unique electronic publication is described as a "journal devoted to the untold tales of aerospacecraft design." More information, including subscription prices, may be found at the following address:

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Left: Juno V booster rocket as presented to NASA in December, 1958

Middle: Juno V booster rocket with manned capsule payload

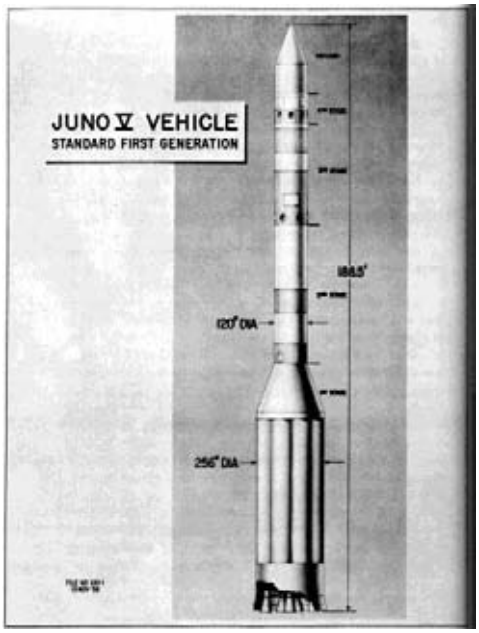
Rght: The sixteen-man capsule envisioned in December, 1958. Note the airlock protruding from the top, the control flaps, the claustrophobic accommodations and the windows on the vehicles side.

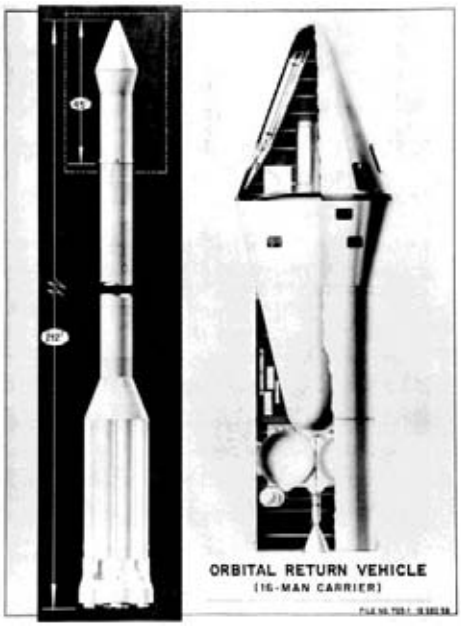
Well before the Apollo program began – before NASA even existed – plans were underway to create a space capsule and launch vehicle using what would become the Saturn I rocket. In December of 1958, Drs. Von Braun and Stuhlinger and Mr. Koelle of the Army Ballistic Missile Agency (ABMA) presented to the National Aeronautics and Space Administration information on launch vehicle work then underway at ABMA. Of central importance was the Juno V, a large launch vehicle of 1.5 million pounds thrust, formed by clustering Redstone and Jupiter propellant tanks with engines derived from that of the Jupiter and Thor IRBMs. This launch vehicle, along with much of the staff of the ABMA would sooner be transferred to NASA; the Juno V would there be renamed the Saturn I.

As of late 1958, the Juno V utilized a first stage clearly recognizable as that of the Saturn I, but used a second stage derived at least in small part from the first stage of the Titan ICBM. A LOX/kero stage would initially be used, but replaced with a hydrogen stage when that was available. The reasons given for using the clustered tank arrangement for the first stage included the obvious, such as ease of design development and manufacture since these were derived from existing tanks. Also ease of transportation was described, as the stage could be disassembled and flown in carrier aircraft such as the C-124. This would allow transport of the Juno V booster to launch sites around the world, without the need to develop dedicated transport aircraft, ships or barges.

A notional manned capsule concept was also presented. Patterned after then-current Langley capsule designs (and clearly influenced by re-entry warhead design work, such as that which produced the Titan II ICBM reentry vehicle), the capsule for the Juno V could carry a total of sixteen astronauts. The capsule seems ~~b~~backwards" to modern eyes; the pointy end is down while on the booster, necessitating a conical fairing covering the blunt forward end. The fairing also covered the airlock and solid rocket abort motors needed to haul the capsule away from the booster in the event of a failure. Somewhat disturbingly, the capsule also had windows on the sides of the cone… in essence, in the heat shield. But this was, after all, just an artist's conception of what a Juno V capsule may look like.

It is interesting to compare this early, clearly optimistic concept for a simple launch vehicle with a massively capable capsule with the current Ares I/Orion concept.





Cranium Cruncher

BILL MILLER, SENIOR MEMBER

From last issue, Alan Simon, Gary Turner, Bill Hahn, David Kin, Dustin Ochoa, Ron Rolando, Bob Maraia, and Douglas Yazell all correctly calculated the side of the box-beam to be 5.79 units. I appreciate the large number of responders and the diverse solution methods!

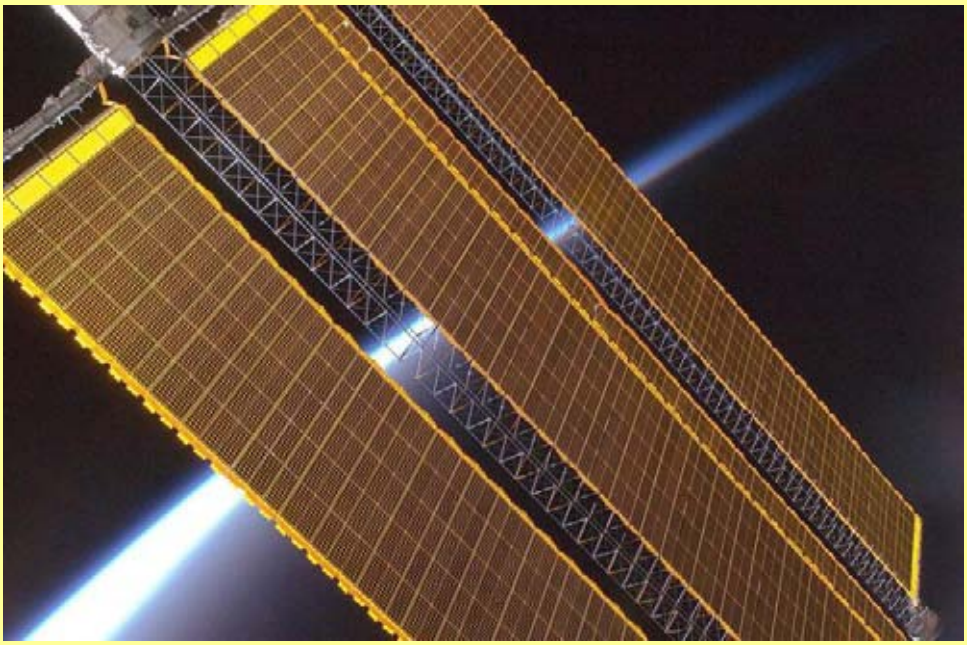
Unfortunately, I lost my notes and cannot give a reference for the source of the puzzle at this time, but I will keep looking and provide it in a future issue if possible.

Here is this issue's cruncher:

A solar array is to be constructed of square panels of two types, power producing panels and structural panels. The panels may not be cut but must be used as whole units. The portion of the array which produces power will be square and will be surrounded by a support area made of the structural panels. The four ~~"st~~ripes" of structural panels surrounding the power producing area are all of different widths, each being one panel wider than the next. The narrowest stripe has the power outlet connection in the center of it. The whole assembly consisting of power producing panels surrounded by the structural panels is also square.

If 621 structural panels are used, how wide is the structural border on the side of the assembly opposite from the power outlet connection?

Send solutions to wbmilleriii@comcast.net. The answer, along with credits, references, and names of the solvers, will be provided next time.



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