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Dawn Arrives at Main Belt Asteroid (4) Vesta

Daniel R. Adamo, astrodynamics consultant

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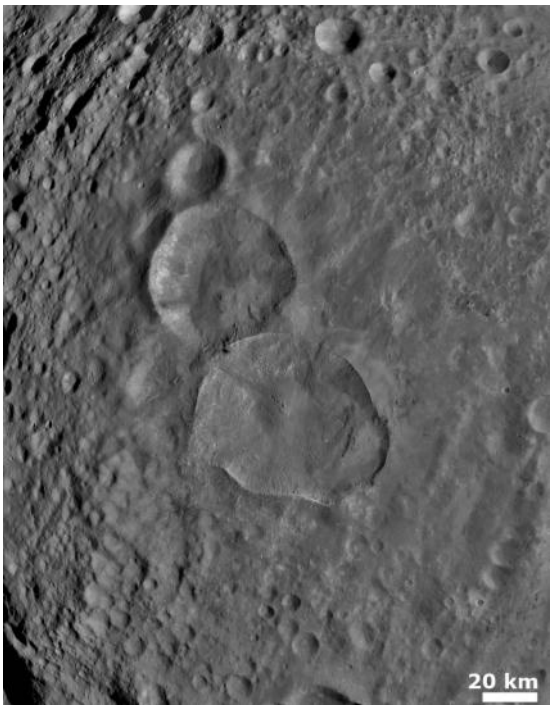
Cover: Image of Vesta Captured by Dawn on July 17, 2011. NASA's Dawn spacecraft obtained this image with its framing camera on July 17, 2011. It was taken from a distance of about 9,500 miles (15,000 kilometers) away from the protoplanet Vesta. Each pixel in the image corresponds to roughly 0.88 miles (1.4 kilometers). Image credit: NASA/JPL-Caltech/UCLA/MPS/DLR/IDA

Our 2011-2012 Year Starting July 1, 2011

From the Chair

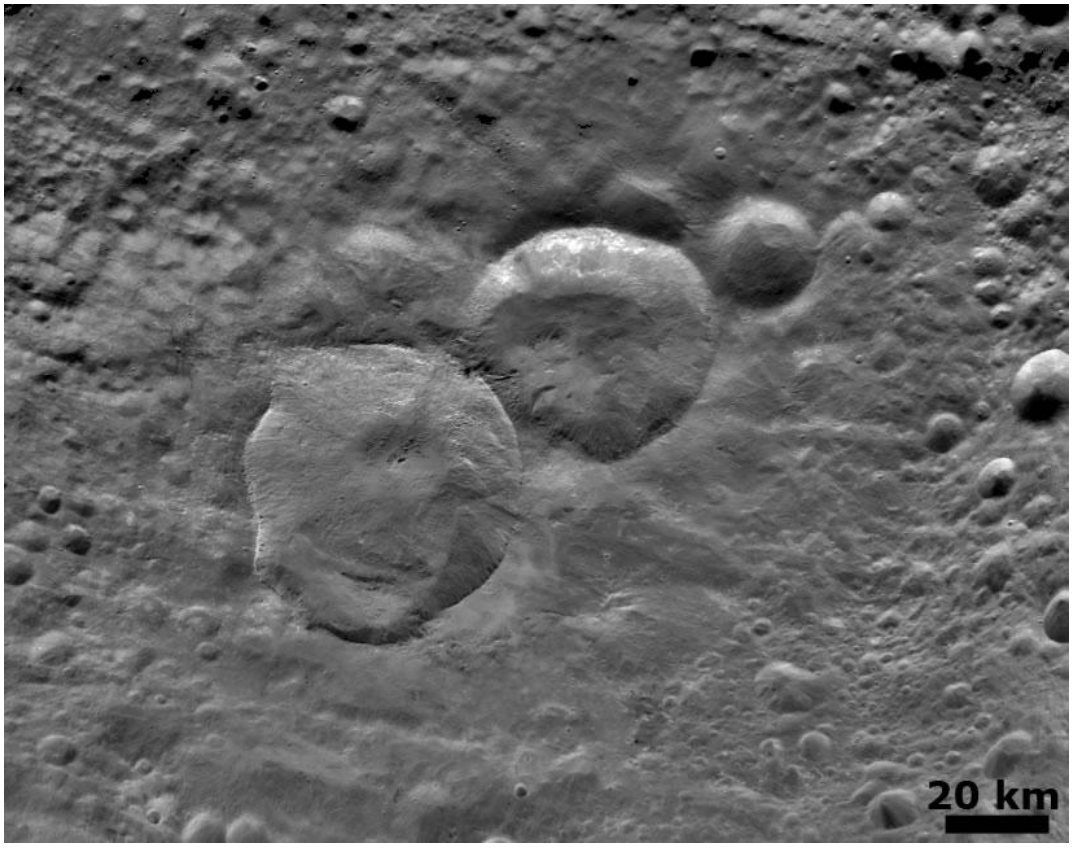
SEAN CARTER

Editor's note: Sean's column will start in our next issue. For this issue, we use this page to add a few more pictures of main belt asteroid (4) Vesta, since NASA's Dawn spacecraft is now in orbit around Vesta.



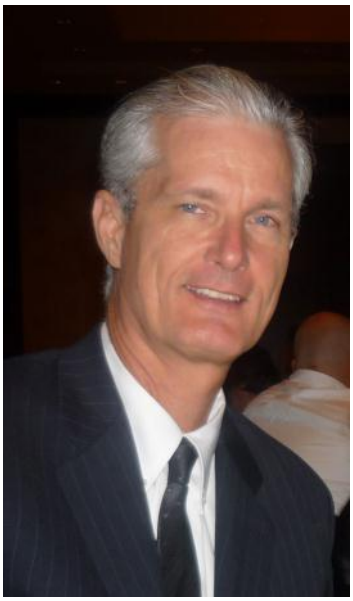
Right: August 13, 2011. NASA's Dawn spacecraft obtained this image with its framing camera on August 6, 2011. This image was taken through the framing camera's clear filter aboard the spacecraft. Credit: NASA/JPL-Caltech/

Above: Sean Carter in 2008 as General Chair of our Annual Technical Symposium at NASA/JSC. Image credit: Douglas Yazell



Left: Detailed "Snowman" Crater. August 17, 2011. NASA's Dawn spacecraft obtained this image with its framing camera on August 6, 2011. This image was taken through the camera's clear filter. Credit: NASA/JPL-Caltech/UCLA/MPS/DLR/IDA

From the Editor



Asteroid Exploration: NASA's Dawn at Vesta

DOUGLAS YAZELL, EDITOR

NASA's Dawn satellite to main belt asteroids (4) Vesta, then (1) Ceres (numbered in order of discovery) launched in 2007. On April 15, 2010, President Obama announced a plan for sending a crew on Orion (now called Multi-Purpose Crew Vehicle, MPCV) to an asteroid in the 2025 time frame. This issue's cover story is a report on this Dawn mission to Vesta by Daniel R. Adamo, an astrodynamics consultant.

I reviewed a report on NEO-Earth impact risk analysis from the National Research Council, "Defending Planet Earth." It's one of two references from the end of Dan Adamo's article (The Red Baron Scenario in an Interplanetary Context) in our last issue, the June 2011 issue. Worldwide, an average of 91 people will die each year from asteroids, and 36,000 will die from earthquakes. But only 20 will die in the USA from earthquakes, based on 200 years of data. If not for the 1906 San Francisco earthquake, that would be 5 people instead of 20. A minority document in an appendix of that report speaks about climate crisis and a conservative estimate of 150,000 annual deaths worldwide.

Our new Horizons schedule is bimonthly instead of quarterly, so this July / August issue will be published online by August 31. I am in France (and Italy) for 8 weeks until August 8, 2011 as I lay out this issue.

As I mentioned in past columns, some space program souvenirs do not belong in museums. My first lapel pin collection is from 2009, the 40th anniversary of Apollo. It's a set of five "official NASA edition" pins, two of which are limited to editions of 1,969. This collection was affordable at about $5 per pin.

Upcoming Apollo 40th anniversaries are Apollo 16 (launch date April 16, 1972), Apollo 17 (launch date December 7, 1972), and the Apollo-Soyuz Test Project (launch date July 15, 1975).

Similar to the 5 Apollo 40th anniversary medallions shown in my last column, two new official NASA space shuttle program medallions are now for sale on various web sites, including The Space Store's web site ($12.95 each), as of this writing on August 1, 2011. These both have color on one side, showing the same logo representing the 30-year space shuttle program. One is the "mission complete" medallion, and one is the "commemorative award" medallion. Both are "official NASA medallions."

Regarding the NASA/JSC mural by Robert McCall, a second source, an expert

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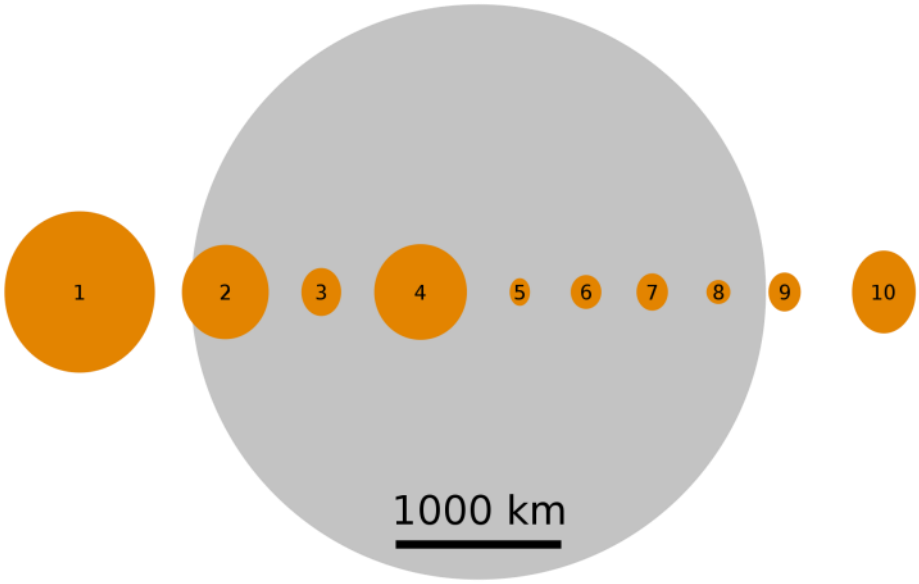


Right: Sizes of the first ten asteroids to be discovered compared to the Earth's Moon, all to scale. The objects, left to right are: 1 dwarf planet Ceres, 2 Pallas, 3 Juno, 4 Vesta, 5 Astraea, 6 Hebe, 7 Iris, 8 Flora, 9 Metis and 10 Hygiea. The scale is 10 km/px on the original image, though not necessarily on the repro here. Image credit: Vystrix Nexoth

(Continued from page 4)
source, confirms that the "lone man by the consoles" (see our June issue and the cover story for our May Horizons) is Sig Sjoberg, so that is confirmed. I was wrong to conclude that astronaut Frederick Gregory is depicted in the mural, though.

Thanks to Patrick Rodi, our section's Annual Technical Symposium (ATS 2011) had a webcast for one presentation, so we plan to use that technology more often at this annual event.

The historic and successful end to the space shuttle program is cause for celebration despite the sadness, as STS-135 ended with the Atlantis orbiter landing safely. Thousands reportedly attended the welcome home ceremony in Houston's Ellington Airport.

Artist and historian Paul Fjeld wrote the following letter to Horizons in response to Captain Hobokan's Apollo Lunar Module (LM) article in our last issue. Paul will write an article for Horizons next year about his work with Apollo LMs in museums and films. We look forward to his contributions.

"After the Apollo 1 fire in January of 1967, the Apollo program had to dramatically shift gears. One fallout was that the first two Lunar Modules were finished by Grumman as unmanned test vehicles only, to preclude the need to fireproof them. When LM-1 flew a mostly successful mission in January 1968, Apollo managers decided the next LM flight would be manned. This left LM-2 on the ground, not because it was un-flightworthy as Captain Hobokan contends (Apollo Lunar Module LM-2, June 2011 Horizons), but because it couldn't fly people.

"Despite this error and his characterization of Grumman management, which I believe was unfair, Captain Hobokan captured the crisis state of the LM program leading up to the first missions very well."

The NASA Dawn spacecraft is scheduled to orbit main belt asteroid 1 Ceres in 2015. See our back cover.

The Houston Chronicle (Laura Weisman, Newswatch, August 16, 2011) quotes the Galveston Daily News saying the Lone Star Flight Museum may move to Ellington International Airport for protection, an obvious reference to damage from hurricanes, such as the recent Hurricane Ike. A final decision may be reached on August 17, 2011.

Until next issue, happy landings!

From the Editor

Letter to the editor from Paul Fjeld.

The Lone Star Flight Museum

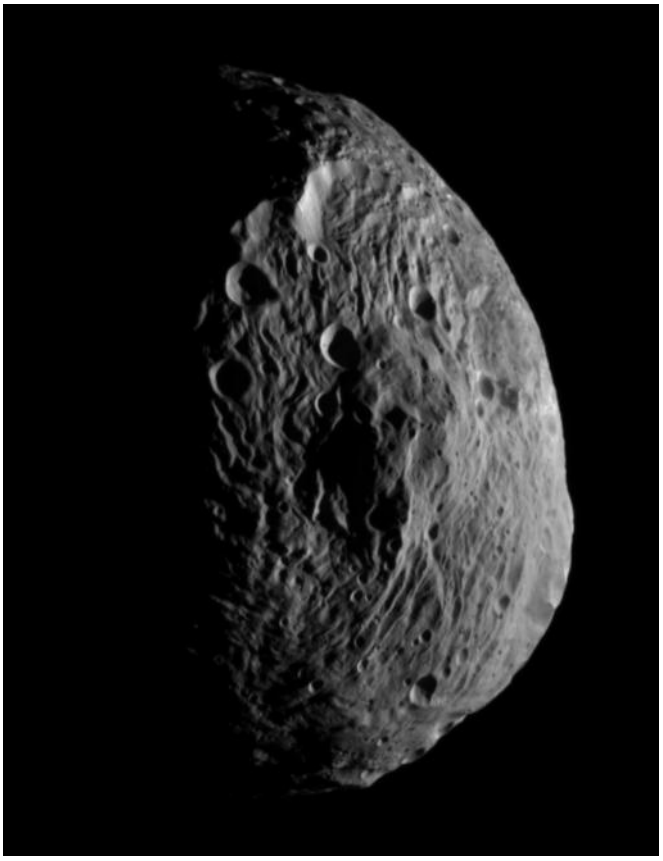
http://www.lsfm.org/

Left: From the back side of "Celebrate Apollo": "Certificate of Authenticity. As the manufacturer of this Apollo 40th boxed set edition, Winco hereby certifies that production has been limited to 1,969 pieces. This boxed set and the featured pins are official NASA editions. Winco has also produced one other Apollo 40th Anniversary boxed set of 1,969 pcs. Both include two pins that are exclusive to this program: the "1968-Apollo-1972" commemorative pin and the "Apollo 11 Lunar Plaque" pin. These exclusive pins will not be available elsewhere. Finer quality space collectibles by Winco International - Chatsworth, CA." Image credit: Douglas Yazell

Vesta

NASA Images of Asteroid (4) Vesta

Right: Image of Vesta Captured by Dawn on July 18, 2011. NASA's Dawn spacecraft obtained this image with its framing camera on July 18, 2011. It was taken from a distance of about 6,500 miles (10,500 kilometers) away from the protoplanet Vesta. The smallest detail visible is about 1.2 miles (2.0 km). Image credit: NASA/JPL-Caltech/ UCLA/MPS/DLR/IDA



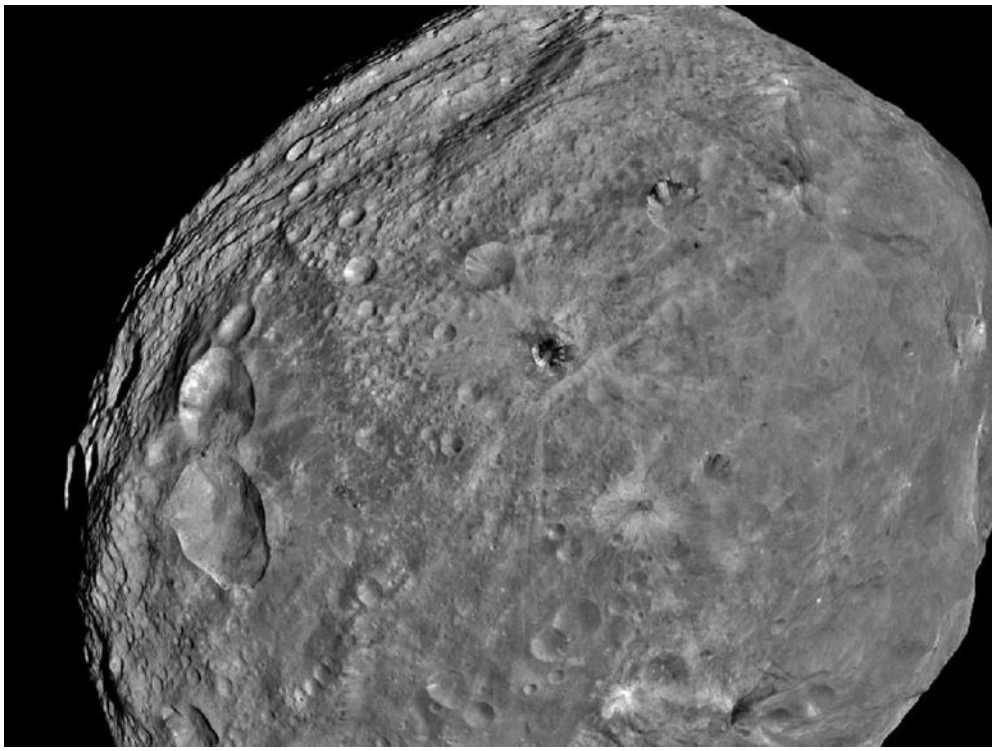
Below: Full-Frame Image of Vesta

NASA's Dawn spacecraft obtained this image of the giant asteroid Vesta with its framing camera on July 24, 2011. It was taken from a distance of about 3,200 miles (5,200 kilometers). Dawn entered orbit around Vesta on July 15, and will spend a year orbiting the body. After that, the next stop on its itinerary will be an encounter with the dwarf planet Ceres.

The Dawn mission to Vesta and Ceres is managed by NASA's Jet Propulsion Laboratory, Pasadena, Calif., for NASA's Science Mission Directorate, Washington, D.C. It is a project of the Discovery Program, managed by NASA's Marshall Space Flight Center, Huntsville, Ala. UCLA is responsible for overall Dawn mission science. Orbital Sciences Corporation of Dulles, Va., designed and built the Dawn spacecraft.

The framing cameras have been developed and built under the leadership of the Max Planck Institute for Solar System Research, Katlenburg-Lindau, Germany, with significant contributions by the German Aerospace Center (DLR) Institute of Planetary Research, Berlin, and in coordination with the Institute of Computer and Communication Network Engineering, Braunschweig, Germany. The framing camera project is funded by NASA, the Max Planck Society and DLR. More information about Dawn is online at http://www.nasa.gov/dawn .

Image credit: NASA/JPL-Caltech/UCLA/ MPS/DLR/IDA



Dawn Arrives at Main Belt Asteroid (4) Vesta

Astrodynamics

DANIEL R. ADAMO, ASTRODYNAMICS CONSULTANT

Launched by a Delta II Heavy rocket on 27 September 2007, the robotic Dawn spacecraft was captured into an initial orbit of main belt asteroid (4) Vesta at approximately 5 AM on 16 July 2011 UTC. According to Dr. Marc D. Rayman of JPL, capture occurred at a point about 16,000 km above Vesta's surface when Dawn was moving at a speed of 27 m/s with respect to the asteroid.

After launch and help from a Mars gravity assist on 18 February 2009, orbit capture by Vesta was made possible by Dawn's solar electric propulsion (SEP) capability. Using any 1 of 3 redundant thrusters fed by ionized xenon, Dawn's SEP generates thrust ranging from 19 to 91 mN. That's roughly equivalent to the weight of a sheet of paper! With an initial Dawn mass of 747.1 kg, maximum SEP thrust yields an acceleration of 0.122 mm/s^2. At that acceleration, it would take 2.55 days for Dawn to generate a change in velocity of 26.8 m/s (60 mph).

Although Dawn's SEP acceleration is tiny, its rate of propellant consumption is downright miserly. The SEP engines are estimated to be capable of thrusting for 2000 days before expending the 425 kg of xenon loaded at launch. As Dawn approached Vesta on 23 June 2011, Dr. Rayman reported 950 days of SEP thrusting had been logged to generate an effective change in velocity of 6.6 km/s. A heliocentric plot of Dawn's rendezvous with Vesta, as viewed from a latitude 45° north of Earth's orbit plane (the ecliptic) appears in Figure 1.

On 3 May 2011, Dawn commenced its Vesta approach phase. During this interval, SEP thrusting was interrupted at weekly and, in later stages, biweekly intervals to obtain navigation and scientific imagery of Vesta. By 23 June

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At that acceleration, it would take 2.55 days for Dawn to generate a change in velocity of 26.8 m/s (60 mph).

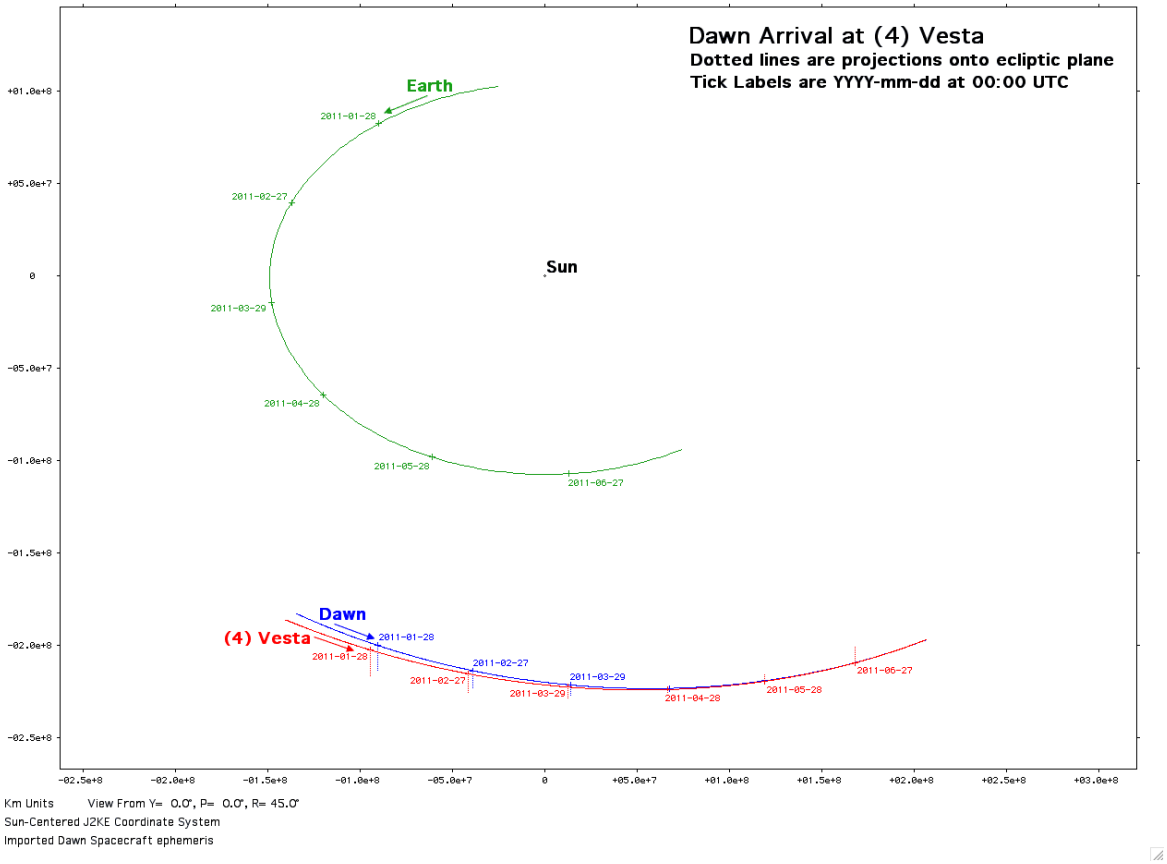

Figure 1. Heliocentric Rendezvous with (4) Vesta by Dawn.

Astrodynamics

A xenon control circuit electrical anomaly, likely caused by a cosmic ray hit, interrupted SEP thrusting from 27 June until 30 June 2011, when a redundant circuit was activated.

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2011, Dr. Rayman reported Dawn's Vesta-relative speed had been reduced to 110 m/s. A xenon control circuit electrical anomaly, likely caused by a cosmic ray hit, interrupted SEP thrusting from 27 June until 30 June 2011, when a redundant circuit was activated. During this interval, Dawn was able to observe Vesta continually throughout one complete axial rotation of 5.3 hrs. By 4 July 2011, Dawn's Vesta-relative speed had been reduced to 75 m/s.

The effect of Dawn thrusting from 30 June until 13 July 2011 is evident in Figure 2. During this interval, the only pause in thrusting was from 9 to 10 July, when additional Vesta imagery was acquired and a search for companions orbiting Vesta was conducted. No such companions have been reported, but analysis of this imagery was ongoing as of 18 July. Perspective in Figure 2 is identical to that in Figure 1. Two trajectories are plotted relative to Vesta. The blue trajectory assumes no thrusting in July, and the green trajectory assumes nominal thrusting until July 13. With respect to Vesta, the green trajectory's eccentricity reduces from 16 to 1.9. Both trajectories perform a Vesta flyby, but very little additional thrusting is necessary to achieve Vesta orbit capture on the green trajectory after July

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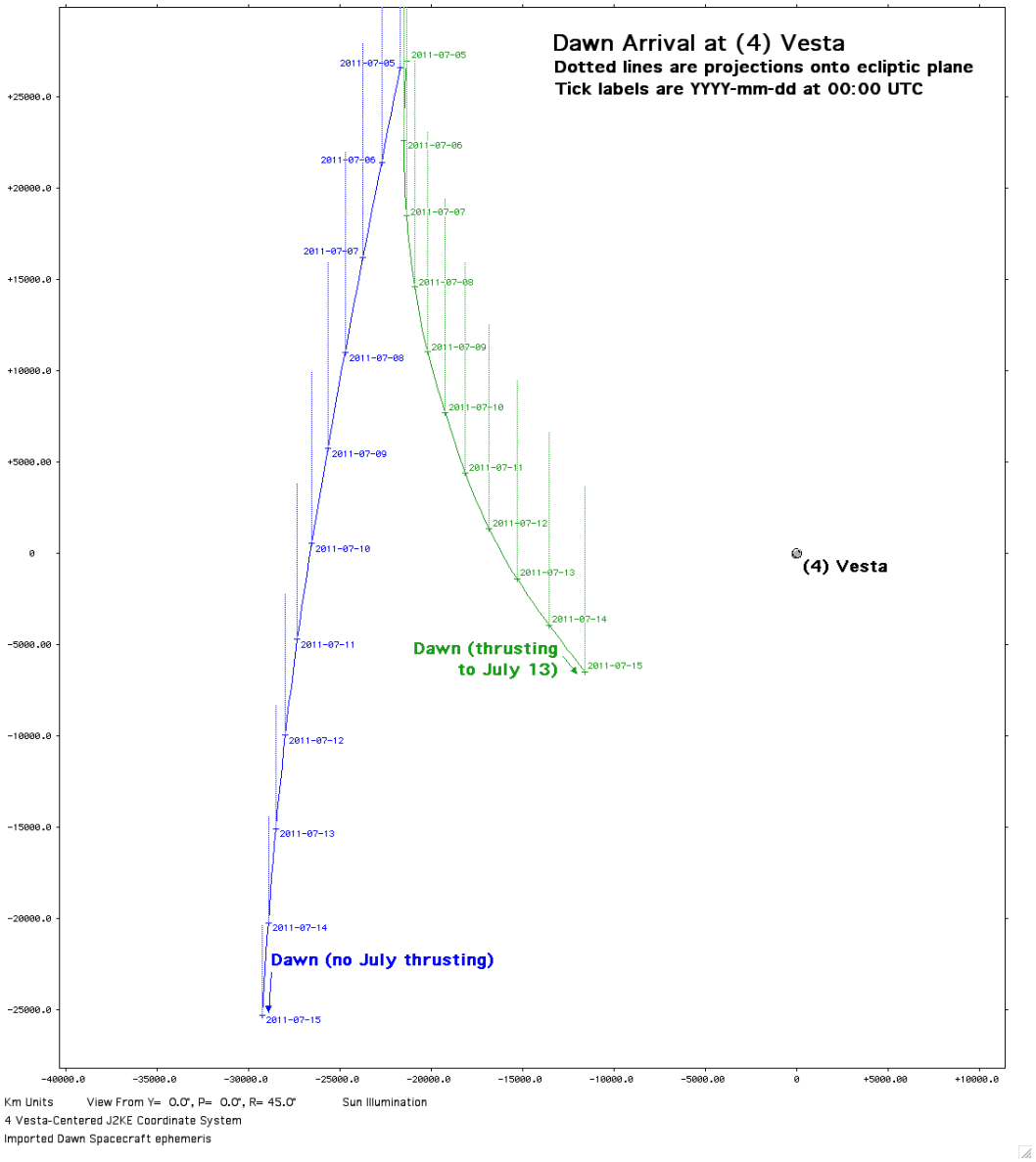

Figure 2. Dawn Trajectories Relative To (4) Vesta Assuming Early Thrust Termination.

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13. Vesta's 530 km diameter, ranking it as second or third largest among asteroids behind (1) Ceres and possibly (2) Pallas, is shown to scale in Figure 2 with its north pole of rotation rendered to an accuracy of several degrees. The shaded area of Vesta is its night side.

Figure 3's perspective and scale are identical to Figure 2's. The single Figure 3 trajectory reflects nominal Dawn thrusting through Vesta orbit capture and into 23 July 2011 as posted by JPL on 18 July. Subsequent thrusting will further reduce Dawn's altitude above Vesta to 2700 km. Detailed science investigation of Vesta is expected to commence from this altitude in mid-August 2011.

Dr. Rayman's "Dawn Journal" commentary, together with other mission status, can be accessed from URL http://dawn.jpl.nasa.gov/. Trajectory data for Dawn are available from JPL's Horizons online solar system data and ephemeris computation service at http://ssd.jpl.nasa.gov/?horizons.

Astrodynamics

Vesta's 530 km diameter, ranking it as second or third largest among asteroids behind (1) Ceres and possibly (2) Pallas, is shown to scale in Figure 2 with its north pole of rotation rendered to an accuracy of several degrees.

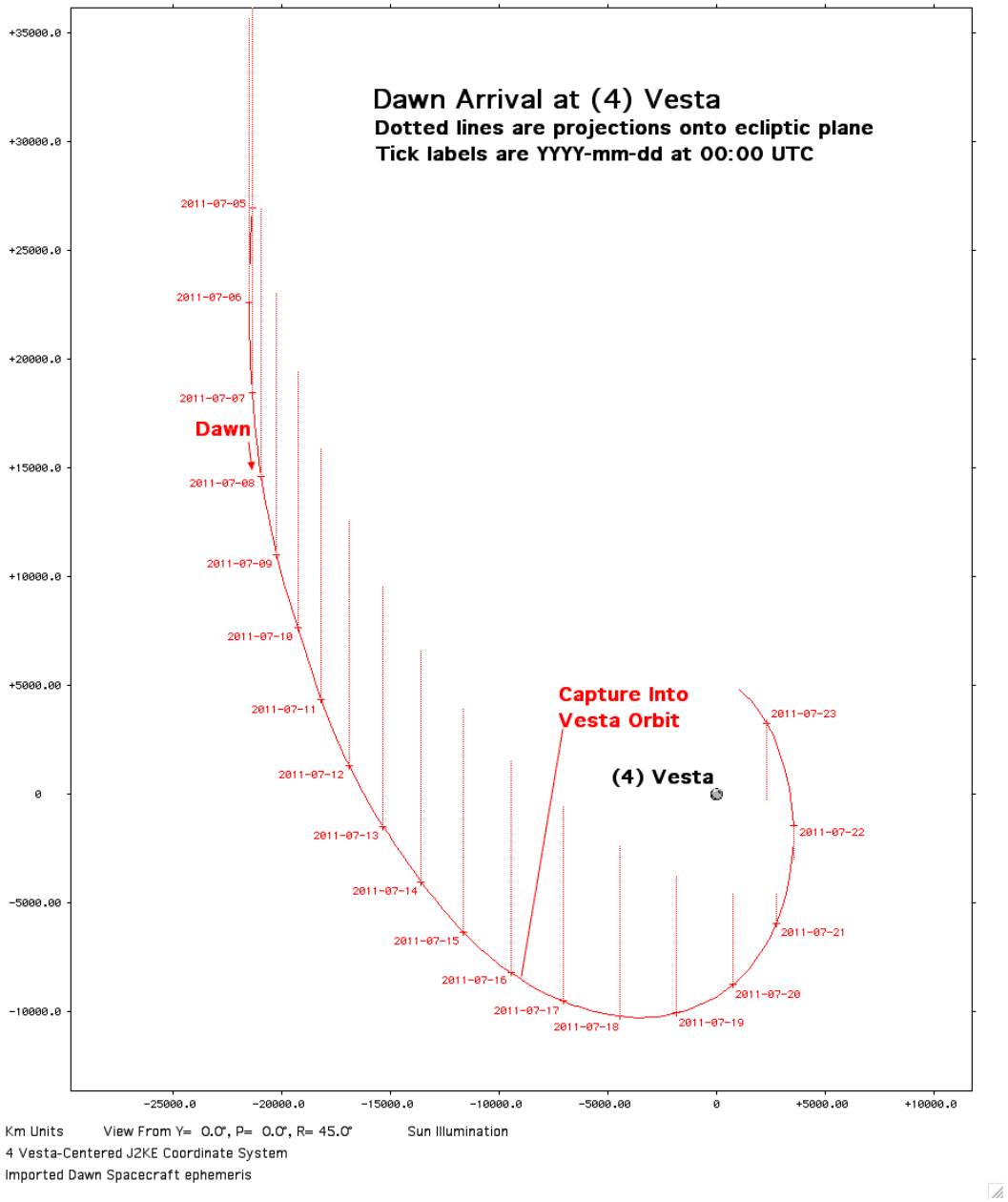

Figure 3. Dawn Trajectory Relative To (4) Vesta With Thrusting Through Orbit Capture.

Feature

Just For the Record

JAMES C. MCLANE III

When I read historical interviews with folks who took part in the Apollo program, I'm immediately struck by how many of them mention building and flying model airplanes when they were kids. A few (like my father) started flying models in the 1930's when aviation was in its exciting infancy. For some of these modelers, this passion carried over into their adult years.

I built my first radio control (RC) plane when I was about 13 years old. My Dad made the vacuum tube radio receiver and transmitter for me from an electronics kit. The rudder and elevator on my model were moved by a mechanical escapement powered by a wound-up rubber band. The radio equipment and batteries were so heavy the plane could barely fly, so the possibility of crashing made each flight very exciting. That was back in the 1950's. By the 1960's transistorized gear and printed circuits came into use, and in the 1970's the integrated circuit and tiny electric actuator motors (servos) made radio control equipment reliable and relatively cheap. The model planes were a lot easier to fly since the newer hardware allowed the pilot to move the control surfaces incrementally rather than choosing only neutral, full up or full down.

In the 1960's an RC model airplane club was formed by employees at NASA's new Manned Spacecraft Center. The club flew their planes on an antenna test range used for the Apollo program. A long paved runway extended out into a pasture west of the Space Center's anechoic chamber building. By the mid 1970's the runway was no longer active with any

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Below: (Left to Right) Unknown participant, Maynard Hill (kneeling) Owen Morris, John Kiker, Unknown flyer holding conventional aircraft used to test timing system. Image credit: James C. McLane III

Feature

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NASA projects so JSC allowed the RC club virtually unlimited access to the area. Arrangements were made for folks who were not NASA or contractor employees to park near the flying site, even though their cars didn't have NASA visitor permits. Most of the models flew slowly, perhaps 30 miles per hour, but there were special racing planes that might approach 100. One club member had a very fast plane powered by a small pulse jet engine (like the old German V-1 buzz bombs), but most flying out at the antenna test range was low and slow. More about the early club can be found at this web site. http://www.jscrcc.com/history.html

The club conducted flying contests and was always casting about for activities that could bring members together. They became enthusiastic over the idea of sponsoring an attempt to set a world's speed record. Since 1905 all formal aviation record trials are conducted under strict rules and regulations established by the Federation Aeronautique Internationale (FAI). This world governing body for air sports, based in Lausanne Switzerland sanctions flying records, even those of model aircraft.

The RC club arranged for the official speed record trials to be held over a weekend in the fall of 1976. The date was set far enough in advance for club members to design, build and test special super-fast RC planes, and several members did just that. The official FAI sanctioned event attracted modelers from other states (more about that later). In spite of advance warning some folks showed up at the event with brand new planes they had never tried to fly!

It doesn't take an aerospace engineer to realize that the dense, humid Houston air was not the best place to attempt a world's speed record, but nevertheless that didn't discourage the club from sponsoring the effort. My memory is fuzzy on this matter, but I seem to recall that the speed record at that time stood at something slightly higher than 200 miles/hour.

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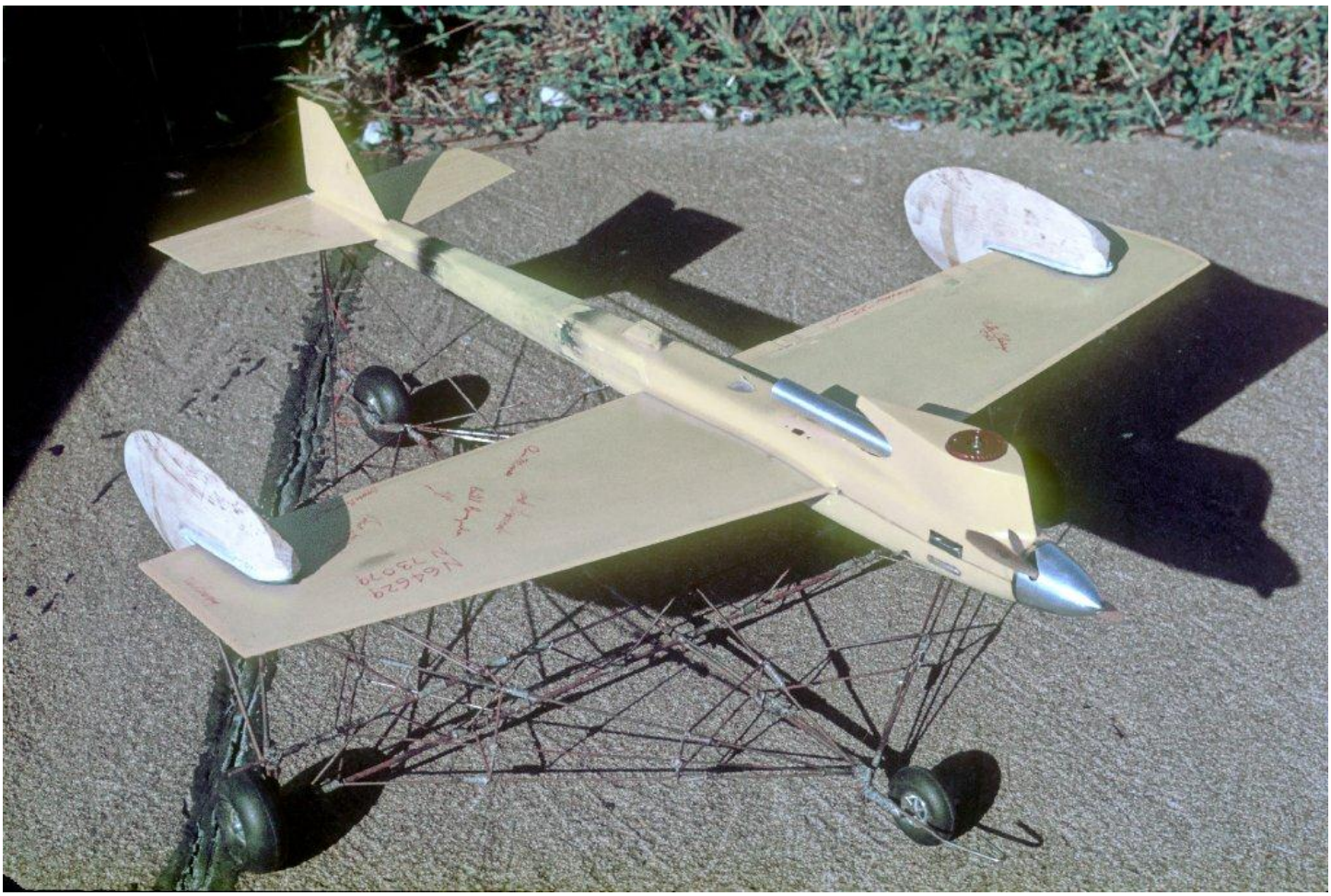
Below: Model resting on its wire space-frame takeoff dolly. Aircraft features thin, sharp wings and tail, cowling on engine and long, tuned exhaust pipe. Wire loop near front dolly wheel could be used for catapult assisted take off. Note the nearly invisible, minimal size control surfaces. Builders/flyers names are written on the wing. Image credit: James C. McLane III



Feature

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FAI rules limited the little two stroke reciprocating model engines to a certain maximum size, but I don't think there were significant restrictions on the shape of the models. The planes would be timed as they flew along a special measured course very close to the ground. Any arrangement set up for model airplanes could also be used for helicopters so the club decided to try to set a world's speed record for those models at the same event. In 1976 RC helicopters were in a very primitive state of development so the existing record was very low (say 20 miles/hour).

By November 1976 all was in readiness. The RC Club had permission to use an auxiliary runway at Ellington Air Force Base for the entire weekend and the weather was great, with clear skies, mild temperatures and light winds.

Out at Ellington volunteers marked off a precisely measured segment of runway, probably something like a 200 foot trap, but I can't recall the exact length. An unusual method was used to determine the model's ground speed. In 1976 there were no such things as hand held police radar guns or laser speed detectors or other inexpensive high tech ways to sense the speed of a flying object. The technique chosen was to erect two tall poles (maybe 15-20 feet high) on each side of the runway. The speed trial would begin when the plane raced across an imaginary portal in space between these two poles. The speed run would end when the model crossed another imaginary portal marked by poles erected 200 feet or so down the runway. The problem was just how to detect when the model crossed those spots.

A clever human-based timing system was used. Several volunteers sat in a line of lawn chairs placed perpendicular to the runway in such a manner that the people were facing the poles. Each person in a chair could see both poles at the same time, one directly in line behind the other. The

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Below: Models skid in for landing on reinforced bottoms, risking a broken propeller. Image credit: James C. McLane III

Feature

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volunteers held push buttons that were electrically connected to a central timing recorder. The volunteers (typically 5 or so on each end of the measured speed trap) stared at the poles and when they saw the model flash by, they pushed their timing button. Down the runway at the far end of the speed trap a similar group of volunteers watched and pushed buttons when the model crossed between their poles. A custom built electronic system (remember this was before the advent of the Personal Computer) averaged the readings from the push buttons (to remove the element of variable human response reaction) and presented a transit time that would translate into a model speed.

Making RC planes go real fast has never been a typical goal because it's no fun flying something that's constantly trying to scoot out of sight. Few modelers had any experience with models where all design features focused on speed. Compared to the typical RC airplane the special planes built for this record attempt could barely get airborne and flew poorly. Their propellers had a very steep pitch that was only effective at high speed. At take off and slow speeds the props were mostly paddle blades providing little thrust. The models did not have conventional wheels, but instead rested on take-off dollies that dropped away when the plane rose up from the runway. Once off the ground, the planes would slowly claw their way into the sky with a low rate of climb. Most models featured a long "tuned" exhaust pipe extending back along the top of the fuselage. The engines were tuned for a very high RPM (which they could never reach on the ground or during their climb to altitude).

Left: 14 must have been a lucky number. Image credit: James C. McLane III

The strategy for setting the speed record was as follows:

After a long roll down the runway the pilot would decide that flying speed had been reached and direct the plane to pull

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Feature

Below: Master modeler Maynard Hill from Maryland. Aircraft shows damage to its single (only) aileron. Rubber balloon contains fuel. Hook and cord attached to front of dolly is part of catapult system that pulls the plane up to take off speed. Image credit: James C. McLane III

(Continued from page 13)

up off the dolly into the air. Then the model would circle around and around as it slowly climbed up to perhaps 1000 or so feet altitude. It would be a tiny object in the sky. The operator would then command the model to pitch over and point its nose at the ground. In a near vertical dive, the model would rapidly gain speed. The high pitch propeller would come into its own, and the sound of the motor would drastically change as engine RPM's suddenly increased. The tuned exhaust pipe would begin to resonate and on the ground we would hear a distant shriek increasing in pitch with Doppler affect as the plane came nearer and nearer. We could tell the plane was in a dive and getting close without even looking up.

If one did look up, there was the worrisome sight of a missile coming rapidly down out of the sky that seemed to be pointed directly at us! The operator would pull the model out of its dive a few feet above the ground just in time to fly between the poles, roar down the measured section of runway, and then pull up when it passed the poles at the far end of the speed run. Usually enough fuel was carried for a few attempts. When the fuel ran out, the model would glide down to a risky belly landing in the grass.

I was helping with this effort. As I mentioned, it was very exciting for those of us on the ground to hear and see one of these things screaming straight down out of the sky. We were praying the wings and tail would stay attached during the high-G pull out at the bottom of the long dive. Over the weekend there were some failures and crashes. These sleek planes were not designed with stability in mind and I saw one aircraft lose radio contact, wander away out of control and be destroyed in a crash.

I watched a man flying a very large home-built helicopter. The chopper was hovering about 3 feet off the ground with the operator standing too close when a gust of wind caused it to suddenly drift

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Feature

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over into him. The heavy spinning blades chopped up his legs so badly he had to leave the site for medical attention.

That weekend a model helicopter did manage to set a world's speed record, but none of the fast planes came even close.

I took a few photos at the event which are reproduced here.

In the middle of the group photo of the men holding their models are famous NASA engineers Owen Morris and John Kiker. Both were especially critical to the success of the Apollo and Space Shuttle programs. Owen was Manager of the Lunar Module and Apollo Spacecraft Program office. After leaving NASA he formed locally-based Eagle Engineering and in spite of being seriously injured in a home built airplane crash in 1998 he is still active in the space program and still flies RC models.

http://www.jsc.nasa.gov/history/oral_histories/MorrisOG/OGM_6-30-99.pdf.

John Kiker was the engineer who promoted the idea that the Space Shuttle orbiter could ride on top of a Boeing 747. He received a Presidential citation for perfecting this concept and proving its practicality by flying a radio controlled model of the piggy back combination. John was a serious aviation enthusiast who owned an airplane before he ever owned a car! He died in 2005.

http://www.jsc.nasa.gov/history/oral_histories/KikerJW/JWK_BIO.pdf

Maynard Hill is the kneeling person holding the futuristic delta wing model below Owen and John. He brought his speed planes down from Maryland for the meet. Maynard had a passion for setting model airplane records that he got by competing with the Russians during the Cold War. He set several international records for altitude and flight

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Below: Engines have acoustically tuned exhaust pipes. Image credit: James C. McLane III

Feature

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duration. As he entered his 70's his eyesight began to fail, but he kept on building models. Late in life he set a goal that was almost impossibly high.

History records that on August 9, 2003 the now legally-blind Maynard Hill poured one gallon of Coleman lantern fuel into the gas tank of an RC plane he had designed and built. This aircraft was one of a series of similar models he had made over the previous few years, but all the others had crashed or been lost at sea. He started the little engine, ran a few steps and threw the 11 pound aircraft into the air. Beyond a couple hundred feet he could no longer see it, so a friend took over radio control. The little plane headed east over the Atlantic Ocean off Cape Fear Newfoundland, guided by a tiny autopilot. 39 hours and nearly 1900 miles later, right on schedule and at the correct location a dot appeared in the sky off the coast of Ireland. A man on the ground flipped a switch on his radio control transmitter to take control of the little airplane and lead it down to a smooth landing. Maynard's model had flown across the Atlantic Ocean all by itself! In spite of blindness Hill had seen his dream become a reality. This achievement was the model airplane world's equivalent of the Apollo 11 moon landing. Maynard Hill on died June 22, 2011 at the age of 83.

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Below: Starting a helicopter with an electric motor. Wind is apparent in bent grass. Image credit: James C. McLane III

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More about Maynard Hill can be read here:

http://www.modelaircraft.org/mag/mhill/hillindex.htm

http://www.telegraph.co.uk/news/obituaries/technology-obituaries/8573491/Maynard-Hill.html

http://online.wsj.com/article/SB10001424052702304778304576377930613461572.html

The End

Feature

Left: Jim McLane (the author) in about 1948 with a gas model Gee Bee. Image credit: James C. McLane III

Left: Jim McLane (the author) in 2009 with a larger model Gee Bee. Image credit: James C. McLane III

Dinner Meeting

Unknown Stories from Space by Bob Zimmerman

DOUGLAS YAZELL, EDITOR

Our section's annual awards dinner meeting took place on June 21, 2011, at Space Center Houston, with AIAA Distinguished Lecturer Robert Zimmerman. Thanks to Programs Chair Angela Beck, two members of the chart-topping band Little Texas, Duane Propes and Dwayne O'Brien, brought their musical talent and inspiration to the event.

From our event flyer, here are a few details. "In the last fifty years the human race has begun the exploration of the cosmos. Sometimes, the events have been newsworthy and famous, such as Yuri Gagarin's first flight and the Apollo 11 landing on the moon. Other times, the adventures of men and women in space have been ignored, hidden, or just plain forgotten. Did you know, for example, the first female tourist in space actually flew almost exactly twenty years ago? Colonizing the planets shall be the most challenging task the human race will ever undertake. In telling some of these obscure space tales, Mr. Zimmerman will explain why these tales are important for future space explorers, and how they illustrate the best in human nature.

"Robert Zimmerman is an award-winning science journalist and historian who has written four books and more than a hundred articles on science, engineering, and the history of space exploration and technology. He also reports on space and science news at his website, http://behindtheblack.com. His newest book, THE UNIVERSE IN A MIRROR: THE SAGA OF THE HUBBLE SPACE TELESCOPE AND THE VISIONARIES WHO BUILT IT (Princeton University Press), tells the story of the people who conceived, built, and saved the

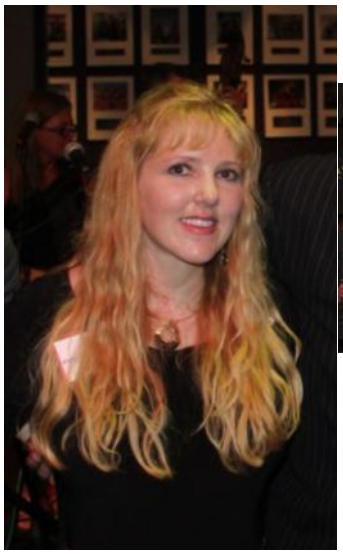
(Continued on page 19)

Images: Our 2010-2011 Section Chair Sarah Shull and guest speaker Robert Zimmerman. Image credits: Ellen Gillespie.

(Continued from page 18)
Hubble Space Telescope. His magazine and newspaper articles have appeared in ASTRONOMY, AIR & SPACE, SCIENCE, NATURAL HISTORY, THE WALL STREET JOURNAL, USA TODAY, WIRED, INVENTION & TECHNOLOGY and a host of other publications."

Music provided by…Duane Propes and Dwayne O'Brien of the Award winning famed country band "Little Texas."

This annual awards dinner meeting gives us a chance to thank the 45 section officers on our council's organization chart, which is always visible on our web site. Our new year started on July 1.



Dinner Meeting

Above and left: Programs Chair Angela Beck at a recent dinner meeting with musician Lydia Salnikova, Jonathan Sandys (grandson of Winston Churchill), Lyle Jenkins, and Sarah Shull. Image credit: Angela Beck.

Left: The 3 men from left to right are Chair Elect Daniel Nobles, and Little Texas band members Duane Propes and Dwayne O'Brien. On the right is Janet Ivey of Janet's Planet on Nashville Public Television in Nashville, Tennessee. Image credit: Ellen Gillespie.

Below: Little Texas band members performing. From left to right, Duane Propes and Dwayne O'Brien. Image credit: Ellen Gillespie.

Space Center Lecture Series

Fifty Years Since Liberty Bell: Perspectives on the Flight of Liberty Bell 7 and the Future of the Space Program

By Dr. James Lewis and Robert F. Thompson

Gary Kitmacher, NASA/JSC

Web site: www.spacecenterlectureseries.com

Co-founders:
Gary Kitmacher
Dr. Benjamin Longmier

Partners:

University of Houston at Clear Lake

University of Houston

Ad Astra Rocket Company

AIAA Houston Section

Kat's Photography

See the web site for upcoming lectures and videos of past lectures. This video will be the 13th presented on the web site. The first was in March of 2008.

This free lecture took place on July 21, 2011, at NASA/JSC Gilruth Center. From the Space Center Lecture Series web site:

"Dr. James L. Lewis, in 1961, was the Command Pilot of Hunt Club One, the code name for the helicopter assigned to recover Astronaut Gus Grissom. In 1961, Lt. Lewis was forced to release the space capsule when a warning light showed a danger of imminent engine failure. In 1999, Dr. Lewis was a member of the Discovery Channel team that recovered the Liberty Bell 7 from the Atlantic Ocean floor. After his career in the US Marines, Dr. Lewis held several management positions in which he contributed to the design of the Gemini, Skylab, Apollo, Space Shuttle, and Space Station Programs. He spent several years prior to retirement as the Division Manager for Space Station in the JSC Man-Systems Division.

"Robert F. Thompson, in 1961, was the head of recovery operations for Mercury and established the recovery processes for Mercury, Gemini and Apollo. In this capacity he was the first person to speak with Gus Grissom after the loss of Liberty Bell 7. Later Thompson became the Program Manager for Skylab and the Space Shuttle. Mr. Thompson graduated with a BS in aeronautical engineering from Virginia Polytechnic and served in the US Navy prior to coming to the NACA in 1947."

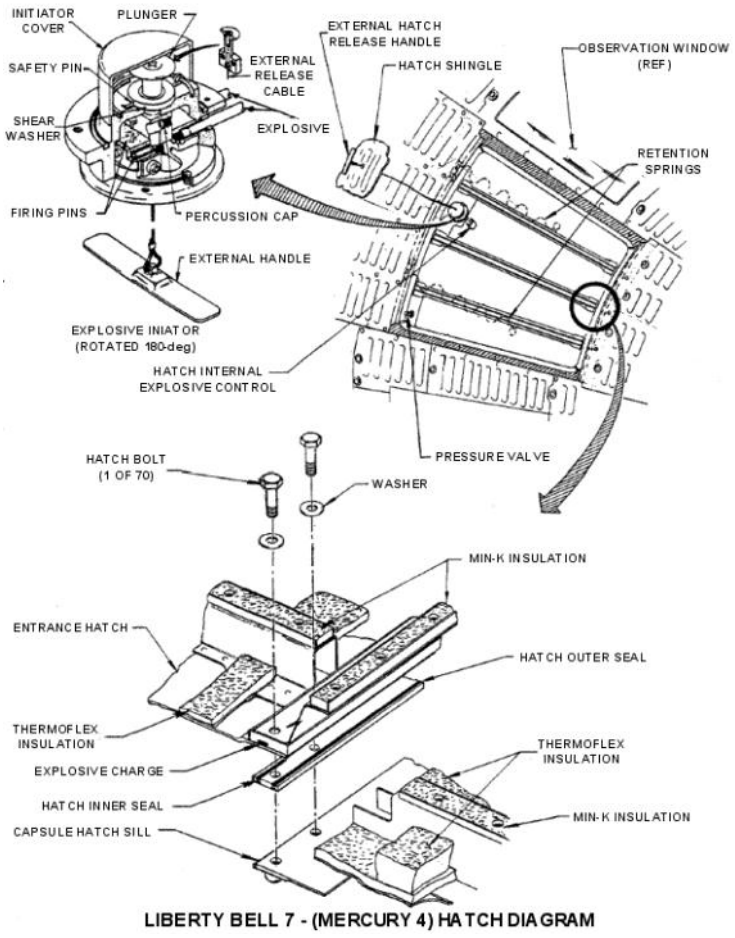
The following summary is based on a few notes taken during a viewing of this video recording.

Dr. Lewis reports that Grissom would never have blown the hatch of Liberty Bell 7. For one thing, Grissom knew he would get wet if he did that.

Dr. Lewis later saw photographs showing that he had lifted all but the heat shield of Liberty Bell 7 out of the water before releasing it, where it then sank to a depth of 3 miles. He reported that it contained about a ton of water when he released it. Dr. Lewis reports that he had all 3 wheels in the water at one point, and his co-pilot, John Reinhard, connected the line or cable or hook to the capsule in the last possible second as the wheels were still in the water.

Dr. Lewis was flying their best helicopter in 1961. Holding that spacecraft was the longest time he ever spent with that aircraft in full power. Smiling, he reminded the audience that once he reached a conclusion about the needed action, he released the spacecraft, he did not drop

(Continued on page 21)



LIBERTY BELL 7 - (MERCURY 4) HATCH DIAGRAM

Right: Liberty Bell 7 Explosive Hatch Diagram. From the NASA Mercury Spacecraft Familiarization Manual - May 1962. Image credit: NASA

The video recording of this presentation is available here: http://www.youtube.com/watch?v=oFmNo8UFMjI

(Continued from page 20)

it.

Robert Thompson explained that this is the first time he is talking in public about this Liberty Bell 7 splashdown and blown hatch.

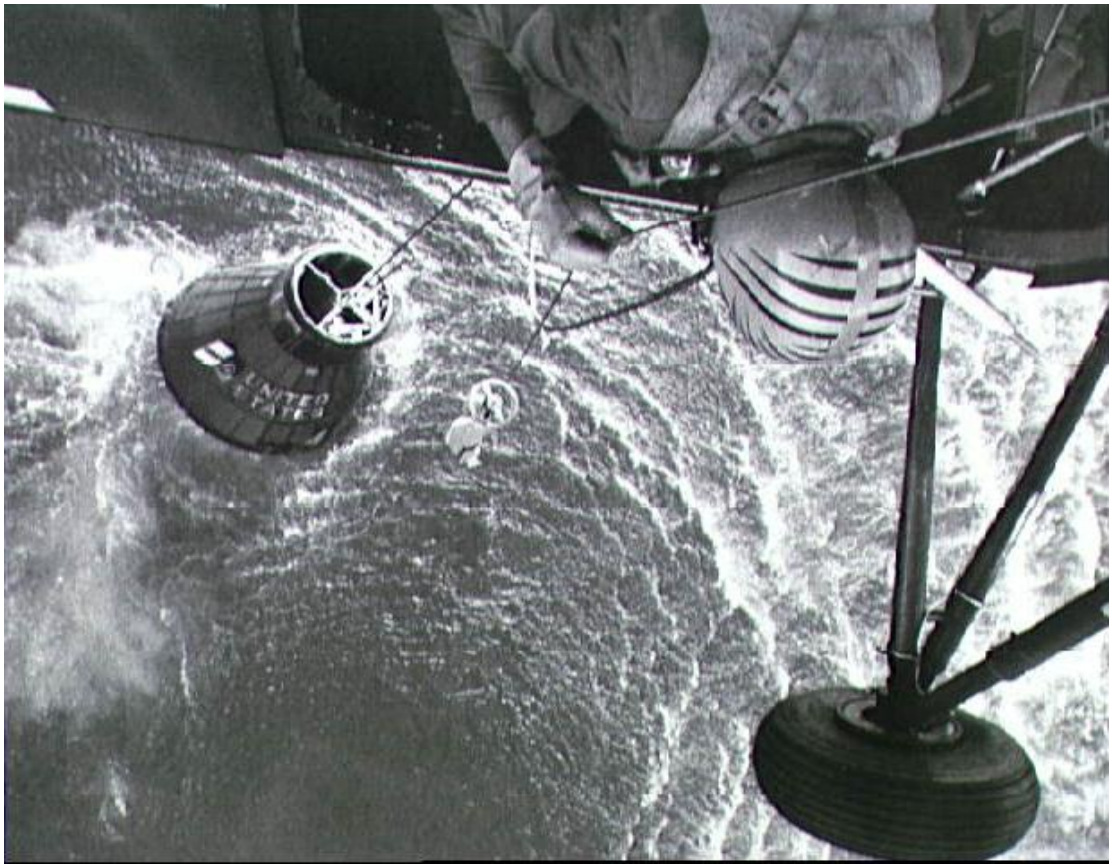
Thompson explained that the Mercury spacecraft were pretty bad boats. The procedure was to have the copter lifting the capsule until the door was at the water level, then the astronaut would blow the door and get hauled up by the copter using a horse collar. He reminded the crowd that this was the second manned American spaceflight, and the first went very well at this point with Al Shepard exiting the spacecraft.

Gilruth and Thompson, stood in the Mercury Redstone blockhouse and listened to the radio as they got reports that the Liberty Bell 7 was lost. Gilruth asked Thompson what he thought had happened. Thompson responded that he didn't know but he'd find out.

Thompson flew to Grand Bahama Island from the Cape Canaveral skid strip, immediately after the Liberty Bell 7 splashdown, arriving just after the physician completed his exam of Grissom and within an hour of the flight. Thompson and Grissom sat down on two beds to talk. Grissom removed a boot and poured out some water. Grissom reported that things went as planned initially with the spacecraft floating in the water. In an effort to get ahead in the checklist, he pulled off the cap, then the pin, but did not push the plunger to blow the hatch. Thompson returned to the Cape and found Robert Gilruth at a splashdown party at the bar at the Starlight Motel, a popular place for flight controllers after a spacecraft return. As Gilruth leaned on a car in the parking lot, Thompson reported that Grissom removed the pin securing the detonation plunger before the helicopter was attached to the spacecraft. Thompson reported that the spacecraft was bouncing and rocking in the water, and something inside the spacecraft, like Grissom's helmet or his shoulder, could have hit the plunger, or the plunger might even have moved without anything hitting it, as only a single O-ring held the plunger in place and there was little stiction preventing it from sliding in response to the spacecraft bobbing in the water.

Thompson reported that Gilruth was satisfied that the spacecraft was OK and everything functioned as it should have, in spite

(Continued on page 22)



Left: Attempted recovery of Mercury spacecraft at end of the Mercury-Redstone 4 (MR-4) mission. A crewman in the helicopter lowers the recovery cable towards the capsule. Catalog Date: 27 July 1961. Film Type: 8x10. NASA image: S61-02824. Image credit: NASA Obtained from: http://www.apolloexplorer.co.uk/photo/html/mr4/10073570.htm

Space Center Lecture Series

(Continued from page 21)
of the prematurely blown hatch. McDonnell, the spacecraft contractor, ran some simple tests, and NASA went ahead with John Glenn's famous flight, the next manned flight in the Mercury program.

Grissom had never been trained on the intricacies of the hatch mechanism and training in those days was not as thorough as it is today. Grissom was simply trying to do a good job by getting ahead in the checklist, and didn't understand the potential consequences of pulling the pin early. Grissom was never penalized.

Thompson then went on to comment on NASA's plans for the next step in human spaceflight (HSF). He said that NASA has concluded that water landing is safer than land landing for the new NASA capsule, the MPCV (Multi Purpose Crew Vehicle, formerly called Orion). Thompson said he disagrees, saying that the safety and suitability depends on design readiness and testing. Thompson said that, in 1970, NASA's ideas were for a space transportation system with the Shuttle providing the earth to low orbit leg, then a tug which could go from low earth orbit to Geostationary Earth Orbit (GEO) and b ac k to LE O. Eventually the transportation system would go to the L1 Lagrange point, then to the Moon. Developing and deploying this system would require 40 to 60 years. They expected the International Partners (IPs) to play a significant role. He said he was surprised that development efforts came to a halt once the Shuttle was flying in the early 1980s.

With Mercury, Gemini, and Apollo, Thompson said the missions were not possible without staging each booster rocket. For Apollo, Lunar Orbit Rendezvous (LOR) was selected as a result of work at the NASA center at Langley. Apollo had to have 7 thrusting stages and was a multi-million pound launch vehicle (LV) .

Thompson showed that from 1958 to 1966, NASA's budget climbed to just less than 5 % of the national budget. President Johnson said the country could not afford that. A Shuttle was looked upon as an economical alternative to the Saturn rockets. But the idea of a two-stage fully reusable vehicle was too complex. So they decided on the Shuttle design as we know it. Key to making it work dependably and to developing it for a reasonable cost, was to have all engines running before it left the ground. Shuttle would be limited to LEO, but would rely on other new stages and orbital vehicles for rendezvous and staging to GEO, L1, and the Moon. They would develop orbital refueling. For some reason, in the last few years, NASA grew impatient but Thompson stated it was wrong to throw away the Shuttle system without having enhanced it and without further developing its capabilities.

Thompson said that he felt the MPCV was not suitable for long duration missions, because a capsule returning to the ocean made for a very poor and dangerous environment for returning long duration astronauts. He said that water is great for landing but makes for a dangerous

Right: Close-up view of Grissom talking on the phone with President Kennedy. Grissom is still wearing his pressure suit. 1961_07_21. S61-02897. Image credit: NASA

(Continued from page 22)
post-landing. After the experience in Mercury, he said the feeling was that they needed to move to land landings for Gemini, but plans for the Gemini rogallo wing were not developed quickly enough.

Thompson spoke about how the inadequately powered Ares I rocket resulted in a poor design that grew worse as more details were developed. He described the Constellation plan as having thrown away systems engineering while throwing the space shuttle program under the bus.

What would you do if you were in charge of NASA now?

Thompson recalled how NACA (National Advisory Council on Aeronautics) was formed in 1917, when people recognized that aeronautics in the US had been stagnating and American pilots were forced to fly French or British aircraft in WWII. The 1957 Sputnik launch resulted in replacing NACA with NASA. NASA was supposed to do things, unlike NACA. NACA conducted research and wrote reports but sought commercial industry to adopt NACA's findings. He recalled how most of his first ten years in NACA was spent conducting studies and writing reports. President Johnson was very supportive; a real space cadet, but he balked at 5% of the national budget. He told Jim Webb to shut down Apollo . That was Johnson, not Nixon. Once Nixon was in office, he did NASA a favor. Nixon stipulated that NASA's budget had to be under 1 % of the national budget for all of NASA's work. Nixon felt Congress and the American people would support that level. Nixon stated that his hands were full with the Vietnam war and social programs left by the prior administration.

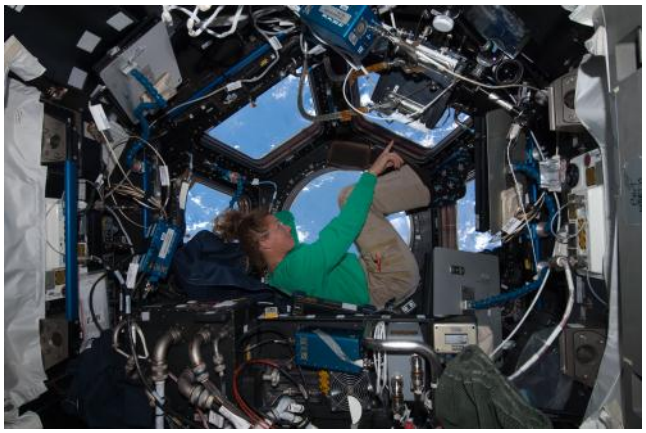
Thompson said he thought staying at 1 % of the national budget for NASA, with about half of that amount for human space flight was a fair plan. He said that as far as where to go, no one could answer that for now. He said that for now lunar and planetary exploration could and should be left to robotic probes and telescopes. NASA, he said, should be working towards a fifty or sixty year plan that establishes a cost effective transportation infrastructure that would get people and hardware almost anywhere in earth orbit, and which would lay the groundwork to get people to more distant destinations. He said that elements of the shuttle system should have been the basis of the system until replaced by more capable and less expensive systems.

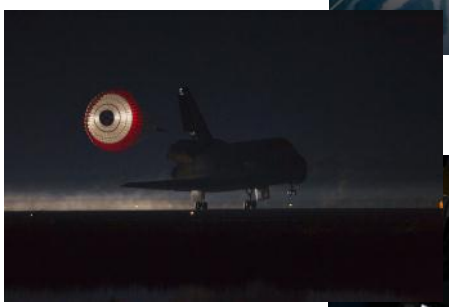
Space Center Lecture Series

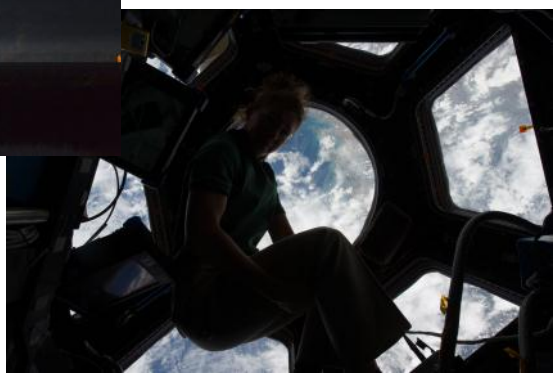
Left: Recovery of Mercury Astronaut Virgil I. (Gus) Grissom at end of the Mercury-Redstone 4 (MR-4) mission. View shows the Marine helicopter pulling the astronaut from the water at the end of a recovery line. The helicopter had to abandon its attempts to recover the spacecraft. Behind the Marine helicopter, a Navy helicopter prepares to assist. 1961_07_21. S61-02819. Image credit: NASA

Current Events

This page: STS-135, the last space shuttle mission. Image credits: NASA







AIAA Daily Launch news summary e-mail note of July 18, 2011 and, at right, August 15, 2011:

Scaled Composites Examining Flying Car Concept

Aviation Week and Space Technology (July 15, 2011, Norris) reported, "Scaled Composites is exploring potential development options for a twin-fuselage, hybrid-powered aircraft that could prove to be a practical solution to the long-held dream of a flying car." The Model 367 BiPod has so far only made "several short hops in ground effect along the main runway at Mojave, Calif., being propelled briefly into the air by building up speed using the battery-powered driving wheels." The article noted "the final design of company founder and former chief technical officer Burt Rutan" before he retired back in April.

NASA Creates New Directorate For Human Space Exploration.

Space (Aug. 15, 2011, Moskowitz) reports, "To embark on its next chapter in human space exploration, NASA has created a new department to oversee manned spaceflight in the post-space-shuttle era." Dubbed the Human Exploration and Operations Mission Directorate, the department "combines two previous organizations, the Space Operations Directorate and the Exploration Systems Mission Directorate." The new directorate "will be responsible for overseeing" the development of heavy-lift rockets that can take astronauts to a space rock by 2025 and on to Mars by the mid 2030s. NASA Administrator Charles Bolden commented, "America is opening a bold new chapter in human space exploration. By combining the resources of Space Operations and Exploration Systems, and creating the Human Exploration and Operations Mission Directorate, we are recommitting ourselves to American leadership in space for years to come."

Current Events

Above: NASA/JSC celebration of the STS-135 space shuttle landing. Image credit: Ellen Gillespie.

We keep the International Space Station (ISS) Expedition 28 crew in mind as we prepare this issue of Horizons. I am writing this as of Saturday, June 25, 2011. A quick glance at NASA's web site leads to a link for missions, and ISS is on a short list under popular missions. That leads to a useful link, "Who is on ISS now?" The answer today is:

Expedition 28
May - September 2011
Satoshi Furukawa
Mike Fossum
Ron Garan
Alexander Samokutyaev
Sergei Volkov
Andrey Borisenko
(Commander)

Left: ISS028-S-002 (22 July 2010) --- Expedition 28 crew members take a break from training at NASA's Johnson Space Center to pose for a crew portrait. Pictured from the right (front row) are Russian cosmonaut Andrey Borisenko, commander; Russian cosmonaut Alexander Samokutyaev and NASA astronaut Mike Fossum, both flight engineers. Pictured from the left (back row) are Japan Aerospace Exploration Agency (JAXA) astronaut Satoshi Furukawa, NASA astronaut Ron Garan and Russian cosmonaut Sergei Volkov, all flight engineers. Photo credit: NASA

Staying Informed

XCOR President Jeff Greason ISDC 2011 Space Policy Speech (Very well regarded)
http://www.nss.org/resources/library/videos/ISDC11greason.html

Commercial Market Assessment for Crew and Cargo Systems
http://www.nasa.gov/pdf/543572main_Section%20403(b)%20Commercial%20Market%20Assessment%20Report%20Final.pdf

Preliminary NASA plan shows Evolved SLS vehicle is 21 years away
http://www.nasaspaceflight.com/2011/07/preliminary-nasa-evolved-sls-vehicle-21-years-away/

Atlas V wins again – Boeing selects launcher for their CST-100 capsule
http://www.nasaspaceflight.com/2011/08/atlas-v-wins-boeing-selects-launcher-cst-100-capsule/

OFT-1: NASA gearing up for Orion's 2013 debut via Delta IV Heavy
http://www.nasaspaceflight.com/2011/08/oft-1-nasa-orions-2013-debut-via-delta-iv-heavy/

NASA interest in an interplanetary highway supported by Propellant Depots
http://www.nasaspaceflight.com/2011/08/nasa-interest-interplanetary-highway-supported-propellant-depots/

NASA preparing to simulate Asteroid EVA protocols via NEEMO mission
http://www.nasaspaceflight.com/2011/08/nasa-simulate-asteroid-eva-protocols-neemo-mission/

China's surge continues with HaiYang-2A launch via Long March 4B
http://www.nasaspaceflight.com/2011/08/chinas-surge-haiyang-21a-launch-long-march-4b/

Below: The cover of the Summer 2007 issue of Horizons illustrating a story about an alternative to NASA's Ares I and Ares V rockets.

Space Shuttle Discovery Flight Deck
http://360vr.com/2011/06/22-discovery-flight-deck-opf_6236/index.html

He had more influence on human spaceflight than almost anyone in history, but few outside the field know the name George Abbey.
http://www.airspacemag.com/space-exploration/Mr-Inside.html

NASA Space Launch System (SLS)
http://www.nasa.gov/exploration/new_space_enterprise/sls_mpcv/index.html
"This theme will develop the launch and spaceflight vehicles that will provide the initial capability for crewed exploration missions beyond LEO. In particular, the Space Launch System (SLS) program will develop the heavy lift vehicle that will launch the crew vehicle, other modules and cargo for these missions.
Space Launch System Program:

- Heavy Lift Launch Vehicle with an initial lift capability of 70-100mt evolvable to the ultimate capability to 130mT
- Reference Vehicle Design is derived from legacy hardware
- Capability to lift the MPCV
- Capabilities to be a backup system for ISS cargo and crew delivery"

NASA's Dawn spacecraft at asteroid (4) Vesta
http://dawn.jpl.nasa.gov

Notes from the editor:

Our new year started on July 1, 2011, with Chair Sean Carter leading the team. Past Chair Sarah Shull and Chair Elect Daniel Nobles are also onboard as part of our leadership team. See page 2 for a list of section officers. Our section's annual leadership retreat took place on August 13.

The organization chart on our web site shows 45 officers on our council, 20 of whom are elected. The 10 Councilors serve two-year terms. The org chart indicates which officers are elected.

AIAA Houston Section

The American Institute of Aeronautics and Astronautics

www.aiaa-houston.org

Our section started in 1962, and the 25th anniversary celebration took place on June 4, 1987, as shown on our history technical committee's web page. We have documentation of that event in a 3-ring binder, thanks to Karen Godek (now Karen Frank, the 1986-1987 Chair) and others. More details about our section's history are on the web site. See the history technical committee's web page. Our section has the opportunity this year (July 1, 2011, though June 30, 2012) to celebrate our section's 50th year in great style. That history technical committee web page has some documents which might help. Also, our web site has quite a few newsletter issues archived. And a national AIAA web site (password required) archives quite a few more issues of our newsletter (back to about 1979), including some created before it was called Horizons. It was simply titled Newlsetter in those early years. The history technical committee web page has that link for our newsletter prior to 2005, and all archived Horizons newsletters will be kept there:

https://info.aiaa.org/Regions/SC/Houston/Newsletters/Forms/AllItems.aspx

Our section hosts the Region IV (a 4-state region) Student Paper Conference this year. Our section hosts that event every other year.

Planned events for this year, July 1, 2011, through June 30, 2012, a partial list (subject to change):
(See the Calendar page, too.)

Dinner meetings (6): September (Congressman Olson), November, January, March, May, June (annual awards/AIAA Distinguished Lecturer)

Lunch-and-Learns, a minimum of one per year from each technical committee

Congressional Visits Day (Washington, DC, mid-March most years)

Wings Over Houston (see our Calendar page)

Observatory Night

Yuri's Night Houston (celebrating events of April 12, 1961, and April 12, 1981)

Spring Rocket Design/Competition

Student Paper Conference

EAA and EAA Chapter 12 Information

In our May 2011 issue we started our series EAA/AIAA profiles in general and experimental aviation with Lance Borden, who is rebuilding his Inland Sport airplane, an aircraft manufactured by his grandfather's 1929 - 1932 company. The second profile in this series starts on this page with Paul F. Dye.

Chapter Mission

The Experimental Aircraft Association's Chapter 12, located at Ellington Field in Houston, is an organization that promotes all forms of recreational aviation. The organization includes interest in homebuilt, experimental, antique and classic, warbirds, aerobatic aircraft, ultra lights, helicopters and commercially manufactured aircraft and the associated technologies.

This organization brings people together with an interest in recreational aviation, facilitating social interaction and information sharing between aviation enthusiasts. Many of the services that EAA offers provide valuable support resources for those that wish develop and improve various skills related to aircraft construction and restoration, piloting, aviation safety, and aviation education. Every individual and organization with an interest in aviation and aviation technology is encouraged to participate (EAA membership is not required, but encouraged). Meetings are generally from 6:30 PM to 9 PM at Ellington Field in Houston Texas. We welcome everyone. Come as you are and bring a guest; we are an all aviation friendly organization!

Ideas for a meeting? Contact Richard at rtsessions "at" earthlink.net, Chapter web site: www.eaa12.org
Experimental Aircraft Association web site: www.eaa.org

Scheduled/Preliminary Chapter 12 Event/Meeting Ideas and Recurring Events:
Monthly Meeting: Chapter 302, 2nd Saturday, 10 AM, Lone Star Builder's Center, Lone Star Executive, Conroe TX
1st Saturday of each month – La Grange TX BBQ Fly-In, Fayette Regional (3T5)
1st Saturday – Waco/Macgregor TX (KPWG), Far East Side of Field, Chap 59, Pancake Breakfast with all the goodies 8-10 AM, Dale Breedlove, jdbvmt "at" netscape.com
2nd Saturday – Lufkin TX Fajita Fly-In (LFK)
2nd Saturday – New Braunfels TX Pancake Fly-In
3rd Saturday – Wings & Wheels, 1941 Air Terminal Museum, Hobby Airport, Houston TX
3rd Saturday – Jasper TX BBQ Lunch Fly-In (JAS)
3rd Saturday – Tyler TX Breakfast Fly-In, 8-11, Pounds Field (TYR)
4th Saturday – Denton TX Tex-Mex Fly-In
4th Saturday – Leesville LA Lunch Fly-In (L39)
4th Saturday – Shreveport LA Lunch Fly-In (DTN)
Last Saturday – Denton Fly-In 11AM-2 PM (KDTO)

Right: Paul's RV-8, nicknamed The Valkyrie. Image credit: Paul F. Dye.

EAA Profile of Paul F. Dye

DOUGLAS YAZELL, EDITOR

Horizons: I googled you and found some great pictures and great articles, especially the one for kitplanes.com, Free Flight, the Soul of the Machine. Your RV-8 Valkyrie with the ℏew'ƥaint job is great.

Paul: It's amazing how much you can find on the Internet about people these days! Yes, I am a Contributing Editor for Kitplanes, been doing that for over a year now, and am developing a free-lance aviation writing "second career" for the future. The RV-8 has gotten a lot of attention in the kit building world, and has appeared in Van's calendar, as well as regularly in Van's rotating ad campaign. Since it's clear you've already found a lot of things I have written, you can tell that I am pretty happy with the plane, and the way it fits in to my personal flying "mission."

Horizons: I realize you are very busy as a NASA flight director and much more.

Paul: Yup – being a Flight Director is one of the greatest jobs in the Aerospace industry! I'd venture to say it is one of the best in the Agency. I have been extremely fortunate to have come on board as a Coop student back before STS-1, and therefore have been involved in flying Shuttle's from the start to the end of the program. Right now, we are flying the last ever Shuttle flight, and while I would much rather keep flying them than park them, it has been nice to "book-end" the program. I have served as Flight Director longer than anyone else in the Shuttle program, and also serve as a Flight Director for the International Space Station when I have the time. I'll be shifting my attention full-time to that program when we are finished with Shuttle.

Horizons: Richard Sessions mentioned that your neighborhood has its own runway.

Paul: As the "New Guy" on the field a couple of years ago, I had to do my stint as "Airstrip Director"….one of those cases of everyone else being smart enough to take one step BACKWARDS when they asked for volunteers. Actually, it was kind of fun, and helped me to get to

(Continued on page 30)

Second in a series of EAA profiles in general and experimental aviation. This series was suggested by Richard Sessions of EAA Chapter 12.

EAA is the Experimental Aircraft Association. The Houston Chapter is #12, one of the earliest created among the hundreds of chapters.

www.eaa12.org.

Left: First Flight: There is nothing like the smile you get after the first flight in an airplane you built yourself. Image credit: Paul F. Dye.

EAA Profile

(Continued from page 29)
know all the neighbors that fly, but I have passed that on to someone else now. I do enjoy living in that neighborhood – I fly almost every day – usually a quick 20 minute aerobatic flight before dinner, just to relax and loosen up. It is great living with your airplanes!

Horizons: I glanced at the Van's RV web site. I skimmed over Van's biography and saw you in some pictures there.

Paul: I am not a "rep" in any official way with Van's – I don't get paid by them – but I am one of their significant cheerleaders! I do appear in their ads, but not by name (I am not allowed to do that with my job), so I am just one of many satisfied customers with the "RV Grin" – that's the smile you get after flying one of these things.

Horizons: So I know you grew up in Minnesota in the Iron Range, with Scandinavian ancestors. I know you worked Shuttle Mir (flight director for 3 flights). I think your first plane ride was in a seaplane. You may have been 13, and your parents were not into aviation, but they did not discourage your love for aviation.

Paul: All very accurate. I was actually born in Bemidji, a logging center in north central Minnesota. Our family's ancestral roots are on the iron range, and I spent my summers there with my grandparents and cousins enjoying the out of doors when I was young. I spent a lot of time in the wilderness canoe country, and am still at home with a paddle, a good "boat", and a back-pack. Dad wanted to be a pilot in WW 2, but didn't pass the color-blindness exam, so he didn't personally pursue aviation, but he and Mom were always supportive. I know that Mom is still nervous about flying, but she did go up with me once – and has gotten on an airliner at least twice that I know of.

Horizons: How many airplanes do you own now? The RV-8 "Valkyrie" (The sight of that plane nicely painted with you standing next to it is inspiring.) More? How many have you built yourself? How often are you in the air piloting?

Paul: Right now, my wife and I have two airplanes – the RV -8 (Valkyrie) and her airplane, an RV-6 (nicknamed "Mikey", as it was built by the Van's factory transition pilot, Mike Seager). Louise is the fourth or fifth owner of the RV-6, and bought it about the time I finished building my RV-8. We met through

(Continued on page 31)

Right: Hanging the engine on Paul and Louise's latest project – the RV-3. Image credit: Paul F. Dye.

EAA Profile

(Continued from page 30)
aviation, at a fly-in out in West Texas.

We are currently building an RV-3, the first of Van's kit designs. Being a very early kit, it is not as sophisticated than the late-model kits, and requires a LOT of interpretation and originality in fabrica-

(Continued on page 32)

Left: Whether he's flying a Cub, or training in the Space Shuttle – it's all flying! Image credit: Paul F. Dye.

EAA Profile

I have been with the Space Shuttle and Space Station programs ever since, first as a Flight Controller, then as a line manager of other Flight Controllers, and finally as a Flight Director, having been selected in 1993 as the 35th person in US history to hold that job.

(Continued from page 31)
tion. It is a great challenge for an experienced builder, and a good training project for Louise, as I am there to help her learn the techniques of building. She has become a good builder in her own right, and is already talking about what she wants to build next!

I previously owned a Grumman Yankee for about 23 years, and was one-third owner of a J-3 Cub for about 10 years. I got my start in aviation through an Aviation Explorer Post when I was a teenager, and we re-built some wrecked J-3 cubs and used them to learn to fly. I have since always worked on airplanes, and made a lot of modifications to my Grumman over the years I owned it.

I fly almost every day now - living at an airpark makes that easy! My routine flying involves everything from local aerobatic sessions to long cross-countries such as trips to Minnesota, Southern California, Oregon, Florida, Washington D.C….. Anything is pretty much within reach of the RV. We can be in any corner of the U.S. from Houston in a long day. Our cabin at Big Bear Lake in Southern California is about 7 hours flying time away.

Horizons: How did you go from junior high school to airplanes to a licensed pilot in high school to a university to NASA/JSC?

Paul: Basically, there has never been a time in my life when I wasn't fascinated by flying machines. My mother says my first word was "Airpoo" as I looked up in the sky and pointed. I was into models of course, including airplane sand rockets. The Aviation Explorer Post gave me my chance to get in to real airplanes, and I was a licensed Private Pilot in High School.

I went to the University of Minnesota for my Aeronautical Engineering degree, specializing in aircraft design and flight testing. In my Junior year, I had the opportunity to apply for the NASA co-op program, which was good, because my primary plan was to go to work for Bellanca Aircraft in Minnesota – and they went bankrupt about that time. NASA assigned me to Mission Control, and I knew that it doesn't get much more exciting than flight operations, and it was better than designing minor aircraft components for Boeing, so I took the permanent job they offered after graduation. I have been with the Space Shuttle and Space Station programs ever since, first as a Flight Controller, then as a line manager of other Flight Controllers, and finally as a Flight Director, having been selected in 1993 as the 35th person in US history to hold that job.

Horizons: Where were your raised? Minnesota? Sounds cold. I read some of your profiles on the internet, cold nights working on airplanes in high school age. One favorite plane was crashed by someone else in the snow.

Paul: Yes, I was raised in Minnesota. Born in Bemidji, moved to the northern suburbs of the Twin Cities when I was five. Spent a lot of time on the Iron Range growing up, and in the Boundary Waters Canoe area. I worked as a Diving Instructor and Chief of Diving Operations through college, spending most of those summers on Lake Superior. Cold? You haven't lived until you've blown out a dry suit zipper 100 feet down in the 38 degree water of the North Shore….

Horizons: Do you have a wife and kids? Pets? Do they fly with you? Are any of them pilots?

Paul: I am married to Dr. Louise Hose, a geologist and internationally-known cave explorer. Louise started flying in her 40's, and we met through aviation at a fly-in I had organized out at Big Bend Ranch State Park. She was working for the National Park Service in Carlsbad, New Mexico at the time, and she moved to a position as a Research Coordinator for the Park Service stationed at A&M once we were married. She commutes from our back yard to Easterwood Field several times a week. No children, but we have two Siberian Huskies, one of which (the smaller one) flies with Louise occasionally. So far, the other one hasn't flown, and neither of the two dogs has asked to become a pilot!

Horizons: Please feel free to add comments about your writing experience and plans.

Paul: I always joke that coming from Minnesota, it makes sense that I can write – because to be a good writer, you need to read a lot, and during a six-month winter (growing up), what else are you going to do but read? Honestly, I

(Continued on page 33)

(Continued from page 32)
have always been a prolific reader in all genres, and in reading, you pick up a lot of good ideas for writing. I did take journalism as an elective in high school, along with creative writing, and had a great young teacher – she really let us work to find our muse. In addition to writing skills and styles, it is – of course – important to have something to say, and I draw upon my technical background and experience in activities from flying to diving to climbing to caving….all of the ways in which I have experienced the world. I have studied aviation topics from the start, and have synthesized a great deal of material on safety and good design. These are many of the things that I share.

With the age of the internet, sharing information became easy, and I wrote extensively on several experimental aviation web forums – most notably Vansairforce.net. It was there that I was noticed by the editor of Kitplanes Magazine – he asked me to come on board in any function I wanted – columnist, editor, feature writer – whatever I wanted to do. I elected to become a Contributing Editor and write a monthly column, as well as developing some series on design and operations. I had always hoped to turn my experience in aviation into a second career of writing when I retired from NASA, and this work has given me an entrance into that world. You don't get rich writing for aviation audiences, but it does give you interesting opportunities and experiences, which is good enough.

I hope to continue to write in the coming years, and might have a book or two in mind. Writing (for me) is either easy or hard work, depending on my mood – I sometimes can write four columns in an evening – or I can go a month without writing much that is useful. I sometimes worry if I will lose the muse, and suffer terminal writer's block – but the answer to that is simply to write some more.

Horizons: Have you been caving / spelunking with your wife and others? It's quite an adventure that I recently came to appreciate after talking with James C. McLane, Jr., about it. I met a couple at the 1940 Air Terminal Museum at Hobby Airport who like both aviation and spelunking, so I wonder if they go together? Maybe it's just the adventure and the exploration?

Paul: Well, we have a saying in cave exploration "Cavers rescue spelunkers!" – it is sort of a runner/jogger thing. Caving is a studied, often scientific exploration of the underground world, whereas spelunking connotes a much more casual approach to poking around in holes. I started caving when I lived in Minnesota in High School, and did some extensive exploration work in the southern parts of the state. When I moved to Texas after college, I basically left the group that I caved with behind, and never picked it up in Texas.

I met Louise through aviation, but quickly learned that she is a world-recognized caver and geologist. We quickly compared notes and our very first "date" was a trip to do some caving in the Guadalupe mountains and Carlsbad Cavern. We have unfortunately been so busy in the last couple of years that we have not had the chance to do much real exploratory caving, but hope to do more in the future. Her world is caves and caves, so I am moving more often in those circles.

Horizons: Thanks very much for being our second subject in this series of profiles in general and experimental aviation! Happy landings!

EAA Profile

Paul: Well, we have a saying in cave exploration "Cavers rescue spelunkers!" – it is sort of a runner/jogger thing. Caving is a studied, often scientific exploration of the underground world, whereas spelunking connotes a much more casual approach to poking around in holes.

Museum

A bimonthly column about the museum.

1940 Air Terminal Museum at Hobby Airport
An AIAA Historic Aerospace Site

DOUGLAS YAZELL, EDITOR

Above: The museum in August of 2010. Image credit: Douglas Yazell

1940 Air Terminal Museum

8325 Travelair Street
Houston, Texas 77061

(713) 454-1940 - Phone

www.1940airterminal.org

From the museum's web site:

Win-A-Plane Raffle Drawing Held!

The 1940 Air Terminal Museum at Hobby Airport awarded the winning ticket holder with his airplane on Saturday afternoon, July 16th during the Wings & Wheels monthly open house. Bradley Elgin, of the independent accounting firm Harper & Pearson selected ticket # 0694, Philip Smith of Pasadena, TX, out of the 2034 tickets sold during the contest. The museum conducts its 'Win-A-Plane' Raffle fundraiser between July and July every year. There are no more than 2500 tickets sold during each contest, and all of the proceeds benefit the non-for profit organization the Houston Aeronautical Heritage Society.

The 1940 Air Terminal Museum began ticket sales for its next raffle plane, a vintage 1958 Cessna 172. Raffle tickets for the new fundraising contest are available for $50 each, and no more than 2,500 tickets will be sold. The winner will be announced at the Museum's July 2012 Wings & Wheels open-house, or a sooner Wings & Wheels if all tickets have been sold. The raffle airplane will be on display at the Museum's monthly Wings & Wheels open houses, at fly-ins and airshows and at popular flying destinations throughout the contest. All proceeds from the raffle go towards the Museum's operational expenses.

Our 172 is a sleek looking airplane sporting black & white trim on a polished aluminum body. Inside, you'll find a vintage instrument panel, along with an interior in original green tweed on vinyl. It is easy to fly, and inexpensive to operate and maintain. It carries up to four people at over 125 miles per hour and uses less than ten gallons of aviation gasoline per hour.

Wings & Wheels will have a new guest for the foreseeable future- a gourmet style hot dog truck. We'll no longer be including lunch in the ticket cost in favor of the truck providing lunch. Accordingly, we've dropped our prices to $7 for Adults and $3 for children. Museum members, fly-in visitors, and vintage car families will get in free!

Upcoming Wings & Wheels events, usually the third Saturday of the month:

August 2011

"Hobbykosh"
Experimental Aircraft Day
(8-20-2011)

September 2011

Women in Aviation Day
(9-17-2011)

October 2011

NOTICE! This month's Wings & Wheels will be held on the 4th Saturday (October 22nd, 2011) to avoid a conflict with Wings Over Houston.

Happy Landings!

Right: The museum's 2010-2011 raffle airplane. Image credit: Douglas Yazell

Our French Sister Section Activities

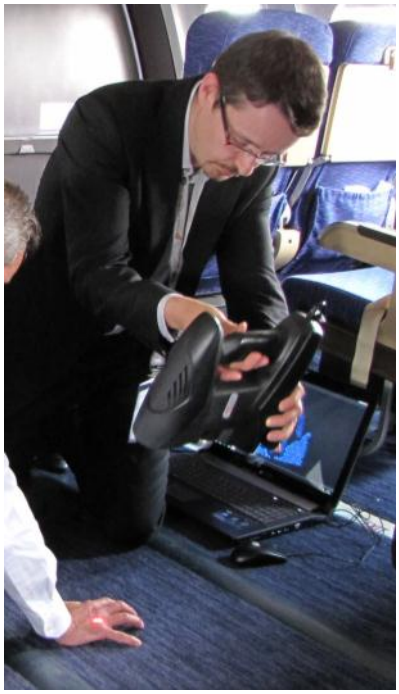
3AF MP

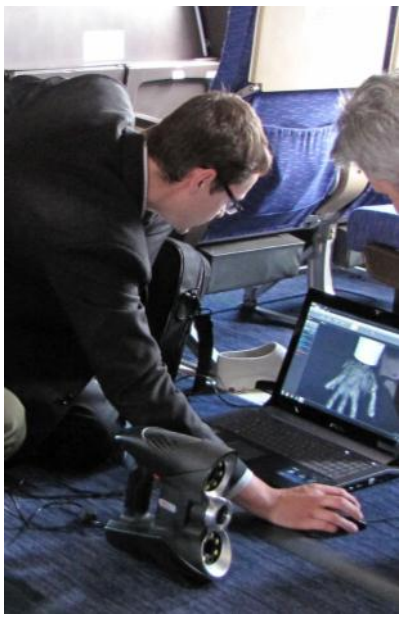
DOUGLAS YAZELL, EDITOR

We continue with exchanges of newsletter articles, as recent issues of Horizons demonstrate on our web site. Our sister section in has a new web site, www.3af-mp.fr.

The 3AF MP President, Francis Guimera, would like to have a teleconference with our section's relevant officers, so our section's Chair Sean Carter and I are the logical people to form the core of our team at that event on this side of the Atlantic.

Since my wife and I are on vacation in France for 8 weeks until August 8, Mr. Guimera invited us to travel about 5 or 6 hours by car to Sete, France, from Albertville, France. Sete is in the Languedoc-Roussillon region of France, not the Midi-Pyrenees region. Francis and his wife were spending some time in Sete, at least 3.5 hours from Toulouse by car. The four of us joined the one employee of the 3AF MP chapter, Joelle Stella, since she was visiting her family in Agde near Sete. The five of us had dinner at a restaurant that night.





Since we were staying two nights in Sete at a hotel, Francis and his wife showed the two of us around Sete all day the next day. We had a great time.

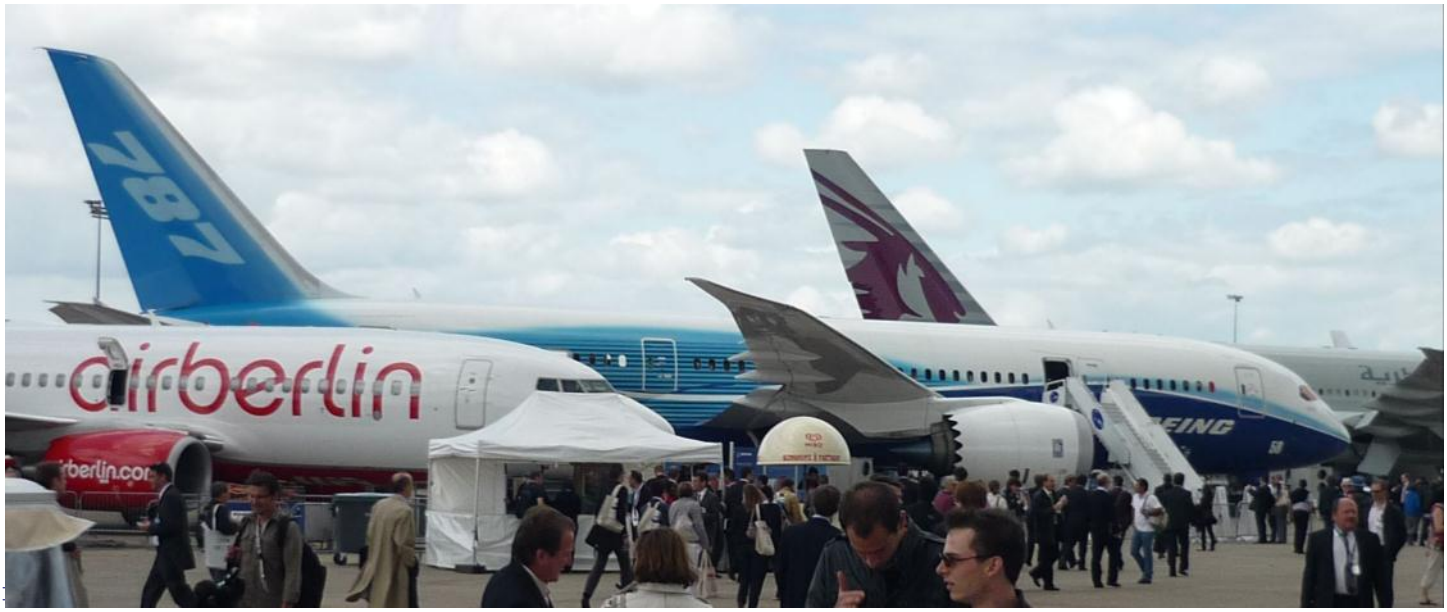
Earlier, my wife and I visited the Paris Air Show a day before it was open to the public, and three photographs are presented here to end this article.

3AF MP: l'Association Aeronautique et Astronautique de France, Midi-Pyrenees chapter, www.3af-mp.fr. Until now, this was 3AF TMP, where the T was for the city of Toulouse.

Our French sister section is 3AF MP. See our web page at www.aiaa-houston.org (technical committees, international space activities committee).

Left: Vincent Lemonde of Noomeo (www.noomeo.eu) demonstrates his company's portable 3D scanner for a friend. This is used in 3D printing, and if I heard correctly, quite a few of these scanners were sold at the Paris Air Show 2011. Image credits: Douglas Yazell

Below: The Boeing 787 Dreamliner at the Paris Air Show 2011. Image credit: Douglas Yazell



APR E-Publication

Aerospace Projects Review (APR) is presented by Scott Lowther, whose unique electronic publication is described as a "journal devoted to the untold tales of aero-spacecraft design." More information, including subscription prices, may be found at the following address:

Scott Lowther
11305 W 10400 N
Thatcher, UT 84337
scottlowther "at" ix.netcom.com
http://www.up-ship.com

Boeing Space Freighter

SCOTT LOWTHER, AEROSPACE PROJECTS REVIEW (APR)

Now that the Space Shuttle program is over, it can be interesting to look at some o the ideas that have arisen over the years for Shuttle derived vehicles and vehicles meant to supplement or replace the Shuttle.

Between the end of the Apollo program and the first flight of the Space Shuttle, one of the seemingly most promising of the large NASA programs was the Solar Power Satellite program. In the years just after the OPEC oil embargo, when the American public got its first taste of energy shortages, the idea gained traction that large satellites in geosynchronous orbit could collect sunlight and beam power to Earth. Johnson Space Center ran a program to develop a spacegoing solar power station. A photovoltaic array in space would have several advantages over a similar array on the ground... weather, dust and nightfall are eliminated; without the day/night cycle and the changing of the seasons, temperatures would be essentially constant. By converting the electrical power generated at the satellite and beaming that power down to Earth via microwaves, a vast area of solar cells could be turned into a relatively small receiving antenna that had the added benefit of being little more than a lightweight mesh. The power receiving antenna could be held aloft by tall posts; the result was that while the mesh absorbed microwaves and converted the energy into electricity, the area below the antenna could be used for a multitude of purposes, including agriculture.

To be meaningfully powerful, the solar power satellites would need to be vast in extent. Several variations on the theme were studied by a number of companies, but in general the proposed designs were long rectangular structures that were commonly compared in size with the island of Manhattan. And even though the satellites were to be built as lightweight as possible, the monumental size required monumental amounts of raw materials to be launched into low Earth orbit. A single 10-gigawatt (2500 net gigawatts at the

(Continued on page 37)

Right: Artists impression of a Space Freighter lifting off (Boeing). Image credit: Scott Lowther.

(Continued from page 36)
terrestrial receiving station) SPS would require in excess of 1,000 Saturn V launches... an economically prohibitive notion with the launch vehicles of the day. What was needed was a far cheaper means of space transport on a vast scale. Boeing designed several vehicles with this in mind. These included Shuttle derived vehicles, small winged heavy lift vehicles with payloads similar to that of the Saturn V, large winged heavy lifters and reusable one and two stage ballistically recoverable heavy lifters. A common feature was virtually complete reusability and the ability to be turned around and launched again in short order.

One such design was called the "Space Freighter." This was a two-stage launch vehicle; each stage resembled a fat Space Shuttle orbiter, but were vastly bigger. The vast size of the vehicle permitted a total payload mass of 424,000 kilograms. The booster used 16 liquid oxygen/liquid methane rocket engines (9,790,000 Newtons thrust each) , while the orbiter used 14 standard SSME's (2,090,000 Newtons thrust each). Gross liftoff weight of the vehicle was 10,878,400 kilograms. Normally a two-stage vehicle of this size would use a booster fueled with kerosene... but with the idea being that SPS's would be built in a world where oil is in increasingly short supply, methane was a fuel that could be produced in the US in vast quantities from coal or natural gas supplies.

The booster used a metallic heat sink thermal protection system (the overall structure was made of 7075 aluminum); the orbiter used Shuttle -type tiles. The booster was equipped with 12 turbofan engines for flyback; the orbiter would, like the Shuttle orbiter, glide back.

The booster and orbiter would be processed horizontally and then transported to the launch pad via a rail system. They would be integrated near the pad in the horizontal orientation, raised vertically at the pad, then fueled and launched.

Six Space Freighters would be required initially; over the span of a 33-year, 60-SPS program, 94 Space Freighters (or equivalent) would be needed.

A single SPS would require

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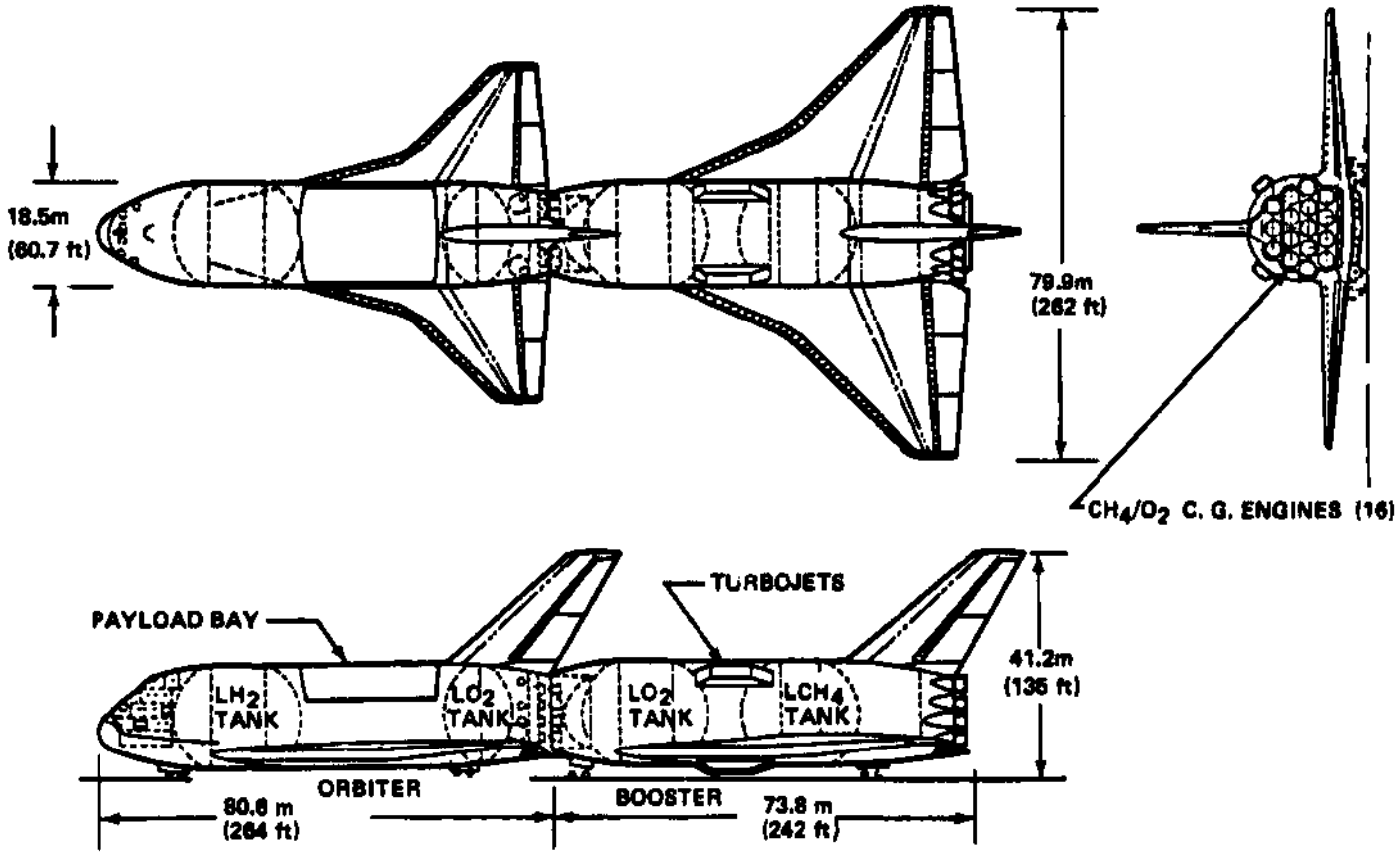
APR E-Publication

Below: Three-view of the Space Freighter (Boeing). Image credit: Scott Lowther



APR E-Publication

(Continued from page 37)

417 total Space Freighter flights, carrying 158,528 metric tons of payload. Development cost of the complete vehicle was expected to cost $11.2 billion. The first-unit production cost of the booster was to be $821.4 million; $638.5 million for the orbiter. Total cost of these flights would be $5.568 billion dollars (1978 dollars). For a one-SPS per year operation, 400 flights per year would be required. These would be carried out on three launch pads. Studies were underway to determine whether it would be better to use conventional pads on the ground at Cape Canaveral, pads built out over the ocean, or floating pads well out to sea.

The Space Freighter program was expected to last for a minimum of 14 years. The cost per flight was expected to be $13,447,000 dollars (1978 dollars... approximately $45 million in 2011 dollars). If the flight rate was bumped up to 1600 per year, the cost per flight was expected to drop to $10,754,000. It is interesting to compare these cost to that of the Space Shuttle, which was somewhere in the area of half a billion dollars per flight, with no more than half a dozen flights per year. Given the difficulty Shuttle had in coming anywhere near its promised flight rates (40 per year) and costs (as low as $25 million/flight were assumed), it seems unlikely that the Space Freighter would have had a whole lot more success.

The design lifespan of the Space Freighter was 300 flights. The Engines would be refurbished after every 50 flights; the airframe after every 100 flights. The intention was that the time from launch to re-integration for the booster would be 62 hours; the orbiter would require 97 hours (24 of which would be spent on orbit). Once the two stages were positioned for integration, launch would occur in another 31 hours. Thus, 128 hours (5 1/3 days) would pass from launch to launch for the orbiter. If that flight rate could actually be maintained, the 300-flight lifespan of the orbiter would be reached in only 4.4 years.

Given the vast resources that the SPS program would have consumed, even with the extraordinarily optimistic assumptions about costs and turnaround times, the program

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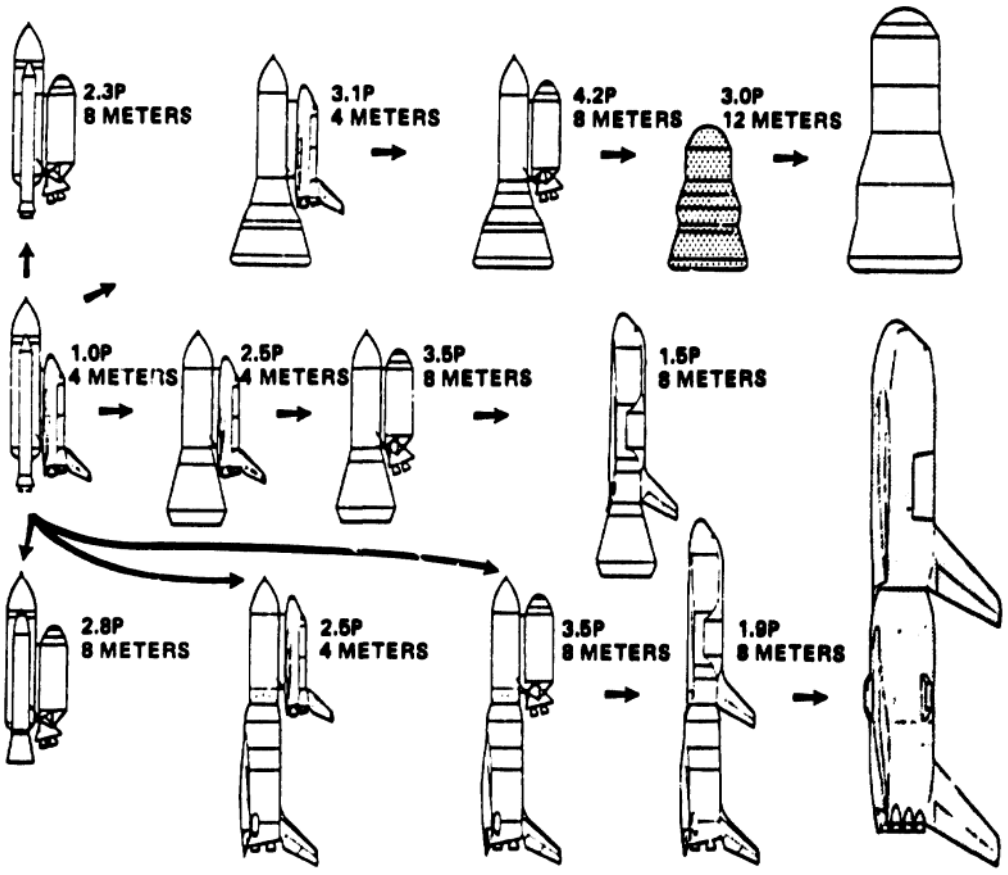

Right: Evolution of potential launch vehicles for the SPS program as seen by Boeing in 1978. For cargo transport, the biggest competitor to Space Freighter was a similarly large two stage to orbit vehicle with ballistically recovered stages. For personnel transport, smaller vehicles were generally envisioned, including Shuttle derived concepts where the solid rocket boosters were replaced with a single ballistically recoverable liquid propellant booster. A passenger module would be installed within the Shuttles cargo bay. Image credit: Scott Lowther.

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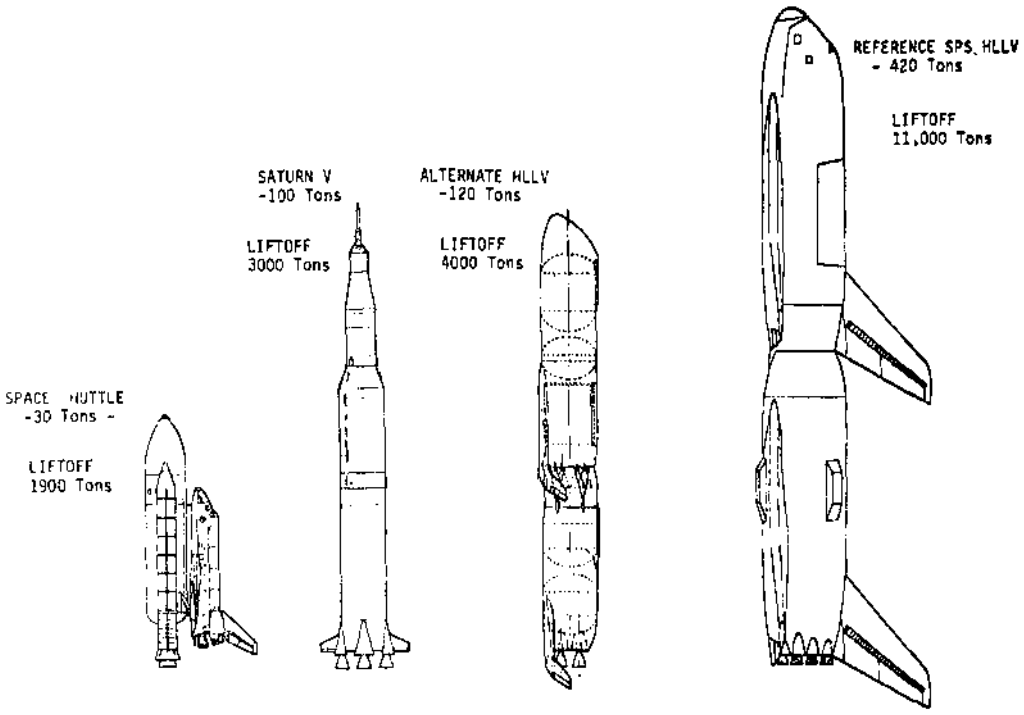
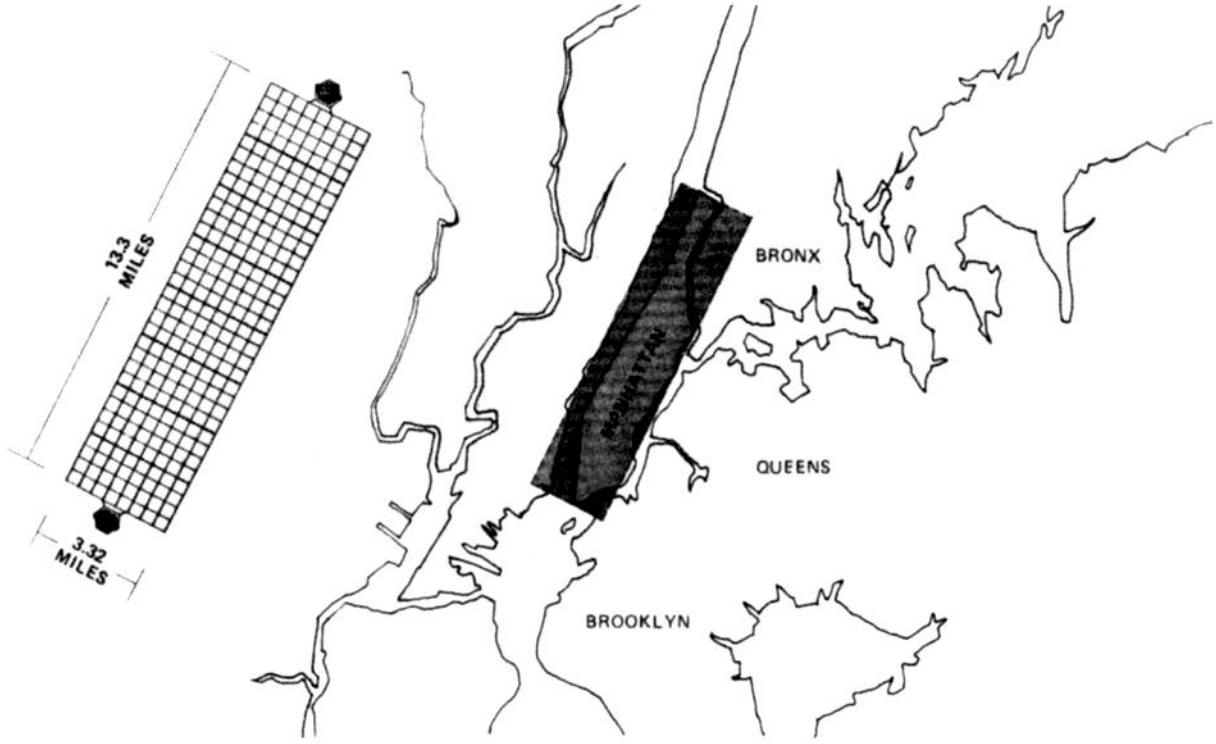
(Continued from page 38)
never really had a chance. And the program utterly collapsed in the early 1980's when the price of oil fell drastically at the end of the OPEC oil embargoes. By this time the Space Freighter had given way to the ballistic boosters, including the single stage "Big Onion" design. And with the end of the SPS program there was suddenly no need at all for such vast launch vehicles.

APR E-Publication



Left: Scale comparison, with gross takeoff and payload weights, of the Space Freighter with the Space Shuttle, the Saturn V and a smaller two stage heavy lifter (Boeing). Image credit: Scott Lowther.

Below: Plan view of a Boeing powersat, and shown to scale over the island of Manhattan. Image credit: Scott Lowther.



Calendar

AIAA Houston Section events and other events related to aeronautics and astronautics. This bimonthly issue of Horizons will be online by August 31, 2011.

AIAA Houston Section council meetings
Time: 5:30—6:30 PM usually
Day: First Monday of most months except for holidays.
July, August and December are often exceptions.
Location: Recent meetings used the San Jacinto room at NASA/JSC Gilruth Center
More information: e-mail chair "at" aiaa-houston.org or secretary "at" aiaa-houston.org

Dinner Meeting
Tuesday, September 6, 2011
Congressman Pete Olson
See www.aiaa-houston.org for details

Council Meeting
Monday, September 12, 2011
NASA/JSC Gilruth Center, San Jacinto room

Wings Over Houston Airshow (AIAA Houston Section booth on Saturday only)
Saturday, October 15, 2011 (airshow dates are both Saturday and Sunday)
Ellington International Airport
www.wingsoverhouston.com
Our booth will be adjacent to booths from:
EAA Chapter 12 (www.eaa12.org) the Experimental Aircraft Association
collectSPACE (collectSPACE.com), The Source for Space History and Artifacts

Council Meeting
Monday, October 3, 2011
NASA/JSC Gilruth Center, San Jacinto room

20 - 22 Sep 2011
11th AIAA Aviation Technology, Integration, and Operations (ATIO) Conference, including the AIAA Balloon Systems Conference and 19th AIAA Lighter-Than-Air Technology Conference
Location: Virginia Beach, VA, Venue: Virginia Beach Convention Center

21 - 22 Sep 2011
AIAA Centennial of Naval Aviation Forum "100 Years of Achievement and Progress"
Location: Virginia Beach, VA, Venue: Virginia Beach Convention Center

22 - 23 Sep 2011, New Horizons in Aviation Forum
Location: Virginia Beach, VA, Venue: Virginia Beach Convention Center

27 - 29 Sep 2011, AIAA Education Alley 2011
Location: Long Beach, CA

27 - 29 Sep 2011, AIAA SPACE 2011 Conference & Exposition
Location: Long Beach, California, Venue: Long Beach Convention Center

May 22-24, 2012
Global Space Exploration Conference, a conference by the IAF and AIAA
L'Enfant Plaza Hotel, Washington, DC, USA
http://www.glex2012.org/index.html

Cranium Cruncher

STEVE EVERETT

Challenge

Last month, readers were challenged with a self-referential aptitude test designed by Jim Propp, a mathematician at the University of Wisconsin at Madison. The answers to these 20 questions are as follows:

1.	d	11.	b
2.	a	12.	a
3.	d	13.	d
4.	b	14.	b
5.	e	15.	a
6.	d	16.	d
7.	d	17.	b
8.	e	18.	a
9.	d	19.	b
10.	a	20.	e

This issue's puzzle is a problem of determining the ages of the members of a family. Upon Tommy's seeing a picture of him and his parents and asking about each person's age, Tommy's father replies as follows:

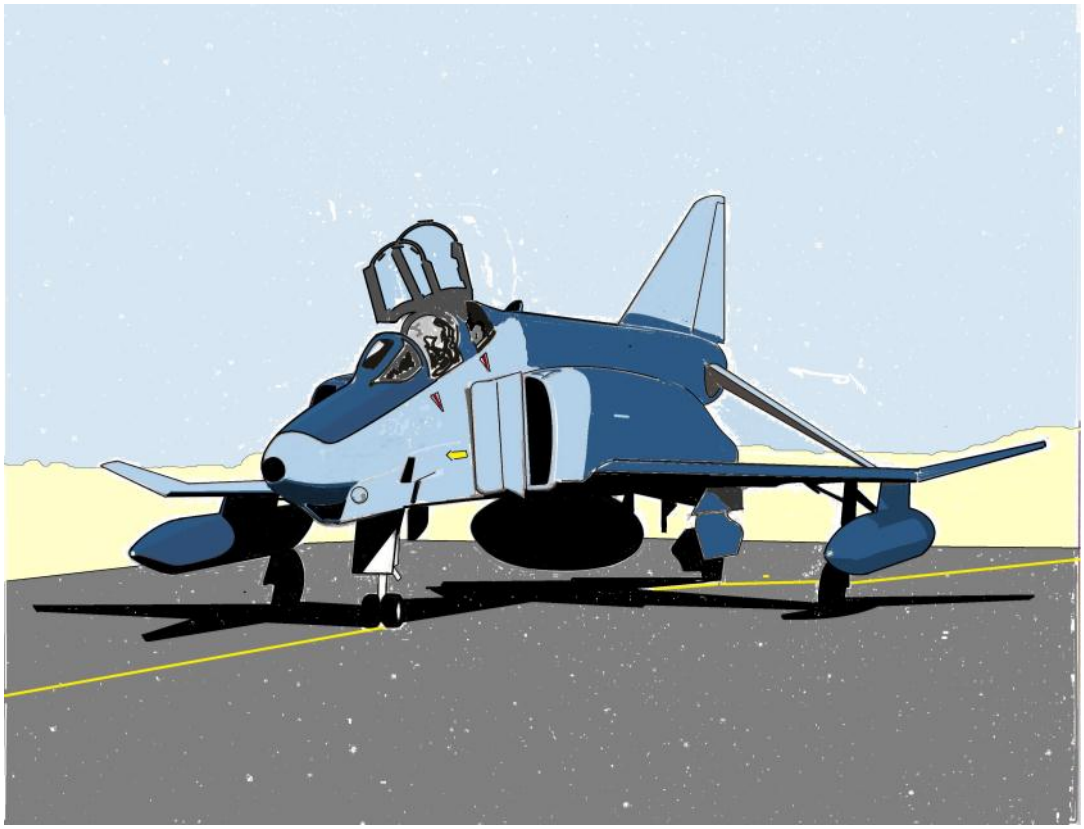
"Now, Tommy, our three ages combined amount to just seventy years. As I am six times as old as you are now, it may be said that when I am but twice as old as you, our three combined ages will be twice what they are at present. Now let me see if you can tell me how old is mother?"

Tommy, being adept at figures, readily solved the problem, but then he had the advantage of knowing his own age and could guess pretty closely the ages of the others. You, however, have merely the data regarding the comparative ages of father and son, followed by the startling question, "How old is mother?"

Send solutions via e-mail to steven.e.everett "at" boeing.com

Art by Don Kulba

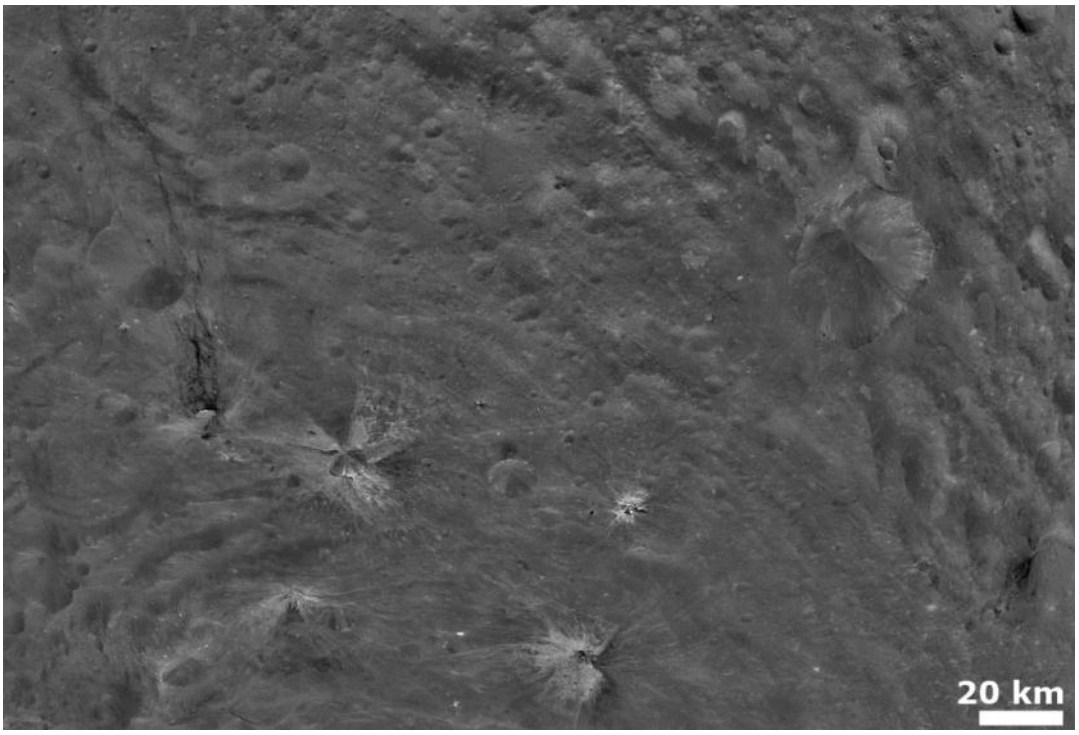
Right: Space Shuttle commemorative patch entry by Don Kulba, contributor



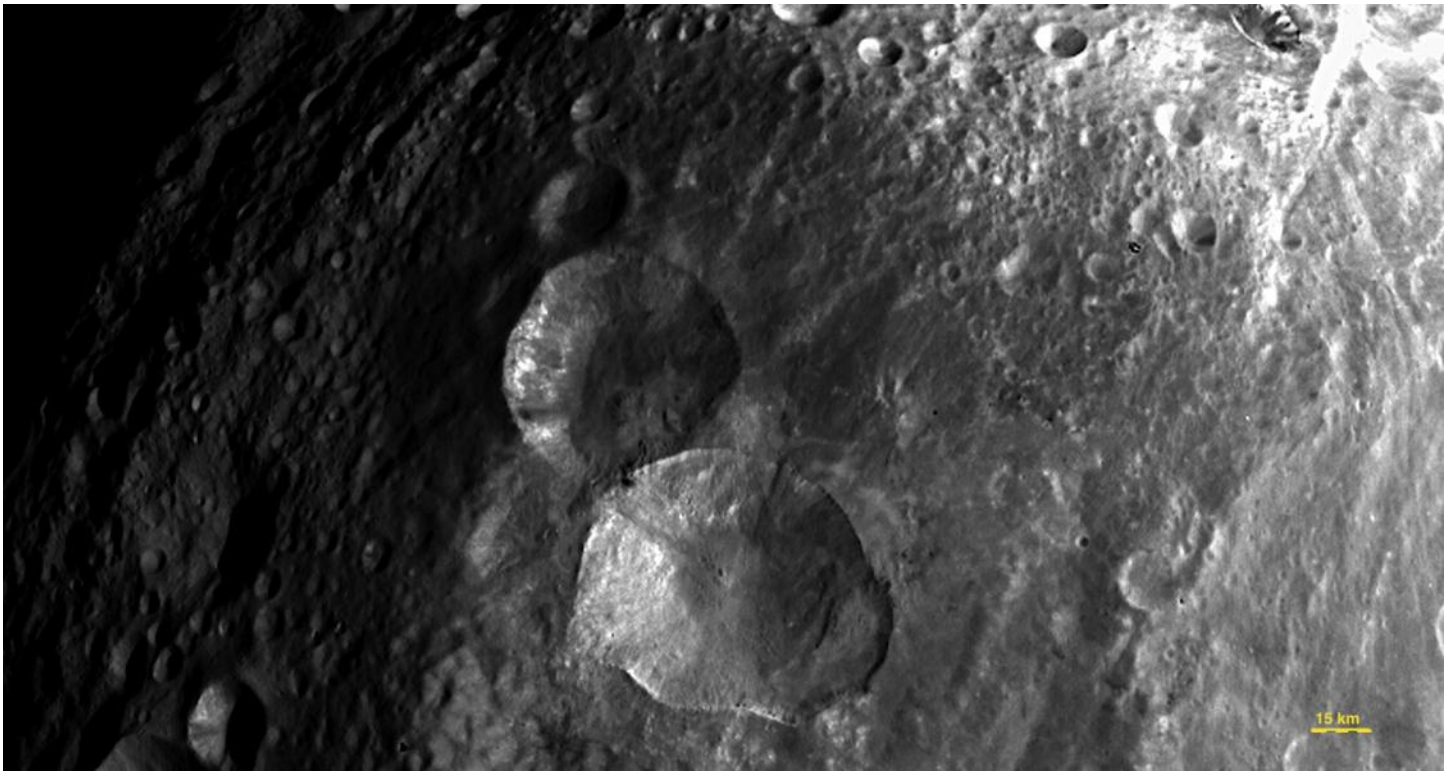
Right: McDonnell Douglas F-4 Phantom, illustrated by Don Kulba, contributor

NASA Images of Asteroid (4) Vesta

Below: Bright and Dark Material on Vesta's Surface.
August 15, 2011 - PASADENA, Calif. -- NASA's Dawn spacecraft obtained this image with its framing camera on August 6, 2011. Image credit: NASA/JPL-Caltech/UCLA/MPS/DLR/IDA



Below: Close-up View of 'Snowman' Craters
August 1, 2011 - PASADENA, Calif. -- In this image, obtained by the framing camera on NASA's Dawn spacecraft, a set of three craters, informally nicknamed Snowman'by the camera's team members, is located in the northern hemisphere of Vesta. The image was taken on July 24, 2011, from a distance of about 3,200 miles (5,200 kilometers). Image credit: NASA/JPL-Caltech/UCLA/MPS/DLR/IDA



Conference Papers Presented or Co-Authored by AIAA Houston Section Members (including papers from Texas A&M University)

COMPILED BY JON BERNDT FROM AIAA AGENDAS, SUBJECT TO CHANGE

AIAA Guidance, Navigation, and Control Conference
AIAA Atmospheric Flight Mechanics Conference
AIAA Modeling and Simulation Technologies Conference
Date: 8 – 11 August
Location: Portland, Oregon
Venue: Oregon Convention Center
Type: AIAA Conference

Gain Scheduling for the Orion Launch Abort Vehicle Controller
S. McNamara, C. Restrepo, E. Medina, R. Whitley, R. Proud, NASA Johnson Space Center, Houston, TX

The Sensor Test for Orion RelNav Risk Mitigation Development Test Objective
J. Christian, H. Hinkel, NASA Johnson Space Center, Houston, TX; S. Maguire, Jacobs, Houston, TX; C. D'Souza, NASA Johnson Space Center, Houston, TX; M. Patangan, Jacobs, Houston, TX

Orion Handling Qualities During ISS Rendezvous and Docking
J. Stephens, Lockheed Martin Corporation, Houston, TX; P. Spehar, NASA Johnson Space Center, Houston, TX; K. Bilimoria, NASA Ames Research Center, Moffett Field, CA; C. Foster, Jacobs, Houston, TX; R. Gonzalez, NASA Johnson Space Center, Houston, TX; K. Sullivan, Lockheed Martin Corporation, Houston, TX; B. Jackson, NASA Langley Research Center, Hampton, VA; J. Hart, J. Brazzel, NASA Johnson Space Center, Houston, TX; G. Vos, Wyle, Houston, TX

Assessment of an Automated Touchdown Detection Algorithm for the Orion Crew Module
R. Gay, NASA Johnson Space Center, Houston, TX; M. Baldwin, Lockheed Martin Space Systems, Bethesda, MD

Orion Entry Handling Qualities Assessments
B. Bihari, NASA Johnson Space Center, Houston, TX

A Distributed Nonlinear Observer Design Method for Output Estimation in Nonlinear Systems
J. Mohammadpour, A. Hooshmand, H. Malki, K. Grigoriadis, University of Houston, Houston, TX; R. Provence, NASA Johnson Space Center, Houston, TX

Mesh-Based Entry Vehicle and Explosive Debris Re-Contact Probability Modeling
M. McPherson, G. Mendeck, NASA Johnson Space Center, Houston, TX

Overview and Independent Validation and Verification
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Predict and Assess Launch Environments
H. Cordova, NASA Johnson Space Center, Houston, TX; F. Leahy, B. Roberts, NASA Marshall Space Flight Center, Huntsville, AL; S. Adelfang, MITS - Dynetics, Huntsville, AL; P. Duffin, D. Puperi, United Space Alliance, Houston, TX

Assessment of Day of Launch Flight Loads
B. Starr, NASA Langley Research Center, Hampton, VA; A. Olds, Analytical Mechanics Associates, Inc., Hampton, VA; I. Yunis, NASA Langley Research Center, Hampton, VA; P. Duffin, D. Puperi, United Space Alliance, Houston, TX; H. Cordova, NASA John-

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son Space Center, Houston, TX

Flight Implementation of Pseudospectral Optimal Control for the TRACE Space Telescope
M. Karpenko, Naval Postgraduate School, Monterey, CA; S. Bhatt, N. Bedrossian, Draper Laboratory, Houston, TX; A. Fleming, Leffler Consulting, LLC, Chantilly, VA; I. Ross, Naval Postgraduate School, Monterey, CA

First Stage Solid Propellant Multi Debris Thermal Analysis
B. Toleman, NASA Johnson Space Center, Houston, TX

Distributed Extended Kalman Filtering for Reliable Navigation on Lunar Surface
A. Hooshmand, J. Mohammadpour, H. Malki, University of Houston, Houston, TX; R. Provence, NASA Johnson Space Center, Houston, TX

Assessment of the Draft AIAA S-119 Flight Dynamic Model Exchange Standard
E. Jackson, D. Murri, NASA Langley Research Center, Hampton, VA; M. Hill, UNISYS Corporation, Hampton, VA; M. Jessick, LZ Technology, Houston, TX; J. Penn, D. Hasan, L-3 Communications, Houston, TX; E. Crues, NASA Johnson Space Center, Houston, TX; R. Falck, NASA Glenn Research Center, Cleveland, OH; T. McCarthy, NASA Dryden Flight Research Center, Edwards, CA; N. Vuong, NASA Ames Research Center, Moffett Field, CA; C. Zimmerman, NASA Marshall Space Flight Center, Huntsville, AL

Mars Science Laboratory Entry Guidance
G. Mendeck, L. Craig, NASA Johnson Space Center, Houston, TX

Design of Launch Vehicle Flight Control Systems Using Ascent Vehicle Stability Analysis Tool
J. Jang, A. Alaniz, R. Hall, N. Bedrossian, Draper Laboratory, Houston, TX; C. Hall, M. Jackson, NASA Marshall Space Flight Center, Huntsville, AL

Dream Chaser On-Orbit Operations: Preliminary Trajectory Design and Analysis
D. Woffinden, Draper Laboratory, Houston, TX; L. Epstein, Draper Laboratory, Cambridge, MA; G. Stafford, T. Mosher, J. Curry, Z. Krevor, Sierra Nevada Corporation, Louisville, CO

A Rescheduling Method for Conflict-Free Continuous Descent Approach
Y. Cao, Purdue University, West Lafayette, IN; S. Rathinam, Texas A&M University, College Station, TX; D. Sun, Purdue University, West Lafayette, IN

Stability Enhancement of a Transonic Wing Using a Simple Passive Attachment
S. Hubbard, M. McFarland, A. Vakakis, L. Bergman, University of Illinois, Urbana-Champaign, Urbana, IL; R. Fontenot, R. Brown, P. Cizmas, T. Strganac, Texas A&M University, College Station, TX

State Estimation for Constrained Systems with Redundant Coordinates
J. Parish, J. Hurtado, Texas A&M University, College Station, TX

A Time-to-Go Control Law for Spacing Vehicles to a Point
L. Weitz, MITRE Corporation, McLean, VA; J. Hurtado, Texas A&M University, College Station, TX

Runway Scheduling Using Generalized Dynamic Programming
J. Montoya, NASA Ames Research Center, Moffett Field, CA; Z. Wood, University of California, Santa Cruz, Santa Cruz, CA; S. Rathinam, Texas A&M University, College Station, TX

Output Tracking of Non-Minimum Phase Aircraft Dynamics
A. Siddarth, J. Valasek, Texas A&M University, College Station, TX

Controlled Manipulation with Multiple Quadrotors
M. Srikanth, Massachusetts Institute of Technology, Cambridge, MA; A. Soto, Texas A&M University, College Station, TX; A. Annaswamy, Massachusetts Institute of Technology, Cambridge, MA; E. Lavretsky, The Boeing Company, Huntington Beach, CA; J. Slotine, Massachusetts Institute of Technology, Cambridge, MA

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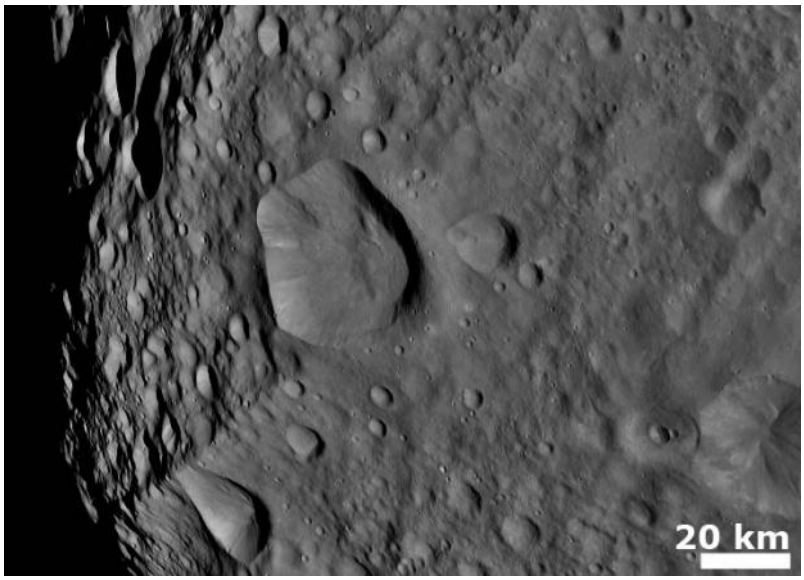
Terrain Mapping and Landing Operations Using Vision Based Navigation Systems
M. Majji, J. Davis, J. Doebbler, J. Junkins, Texas A&M University, College Station, TX; M. Vavrina, J. Vian, The Boeing Company, Seattle, WA

Characterizing and Calibrating the Novel PhaseSpace Camera System
J. Davis, J. Doebbler, Texas A&M University, College Station, TX; M. Vavrina, The Boeing Company, Seattle, WA

Pattern Recognition for a Flight Dynamics Monte Carlo Simulation
C. Restrepo, NASA Johnson Space Center, Houston, TX; J. Hurtado, Texas A&M University, Houston, TX

Flight Validation of a Multi-Degree-of-Freedom Flux-Pinning Spacecraft Model
L. Jones, Cornell University, Ithaca, NY; W. Wilson, Texas A&M University, College Station, TX; J. Gorsuch, J. Shoer, M. Peck, Cornell University, Ithaca, NY

Right: Cratered Terrain with Hills and Ridges. August 14, 2011 - PASADENA, Calif. -- NASA's Dawn spacecraft obtained this image with its framing camera on August 6, 2011.



The Dawn mission to Vesta and Ceres is managed by the Jet Propulsion Laboratory, for NASA's Science Mission Directorate, Washington, D.C. It is a project of the Discovery Program managed by NASA's Marshall Space Flight Center, Huntsville, Ala. UCLA, is responsible for overall Dawn mission science. Orbital Sciences Corporation of Dulles, Va., designed and built the Dawn spacecraft.

The framing cameras were developed and built under the leadership of the Max Planck Institute for Solar System Research, Katlenburg-Lindau, Germany, with significant contributions by the German Aerospace Center (DLR) Institute of Planetary Research, Berlin, and in coordination with the Institute of Computer and Communication Network Engineering, Braunschweig. The framing camera project is funded by NASA, the Max Planck Society and DLR. JPL is a division of the California Institute of Technology, in Pasadena. More information about Dawn is online at http://www.nasa.gov/dawn.

Right: Densely Cratered Terrain Near the Terminator. August 16, 2011 - PASADENA, Calif. -- NASA's Dawn spacecraft obtained this image with its framing camera on August 6, 2011.

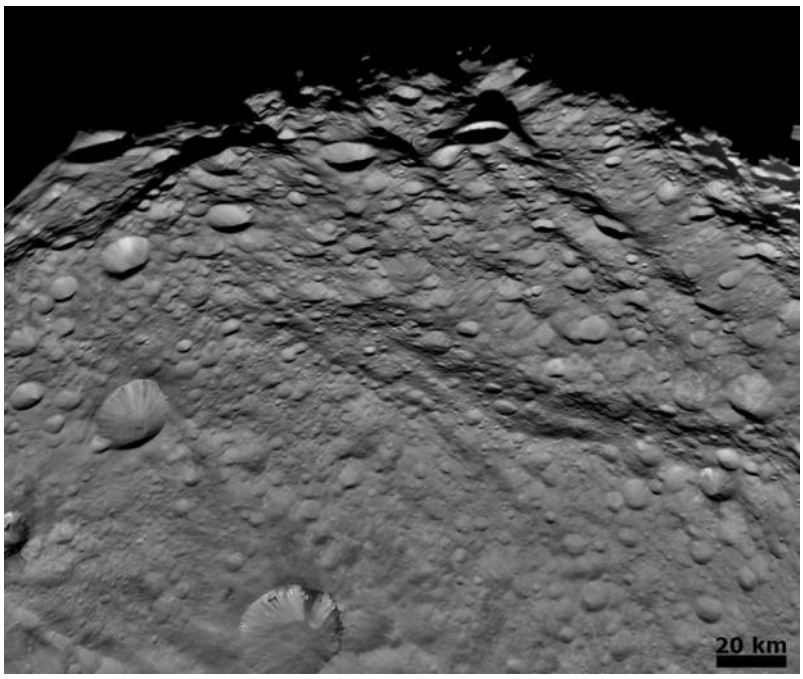
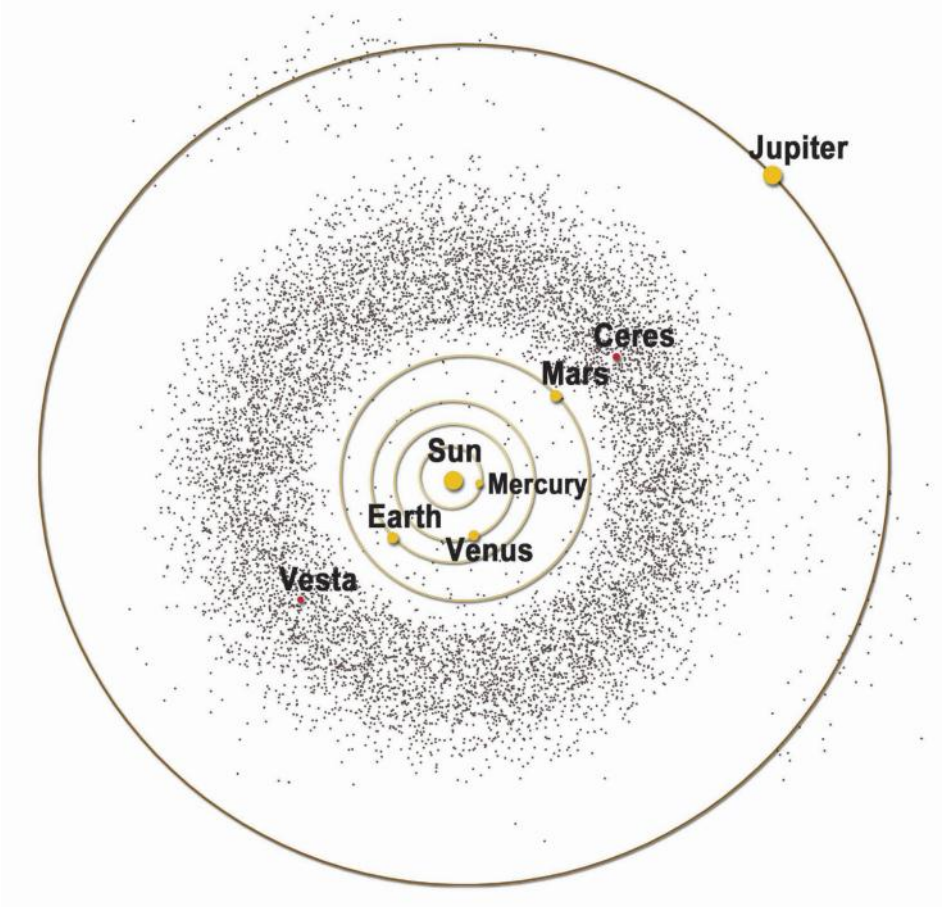


Image credits: NASA/JPL-Caltech/UCLA/MPS/DLR/IDA

NASA Images for Dawn Spacecraft & Mission

Vesta

Left: NASA's Dawn Mission Artwork. Image credit: McREL. Obtained from http://dawn.jpl.nasa.gov.



Left: Art showing the ecliptic plane from a viewpoint 90 degrees away from that plane. Asteroids (1) Ceres and (4) Vesta are shown, since they are the destinations for NASA's Dawn Spacecraft. This art also shows the Trojan asteroids of Jupiter. (A few weeks ago, the first confirmation of an Earth Trojan asteroid, 2010 TK_7, was announced.) Image credit: McREL. Obtained from http://dawn.jpl.nasa.gov.

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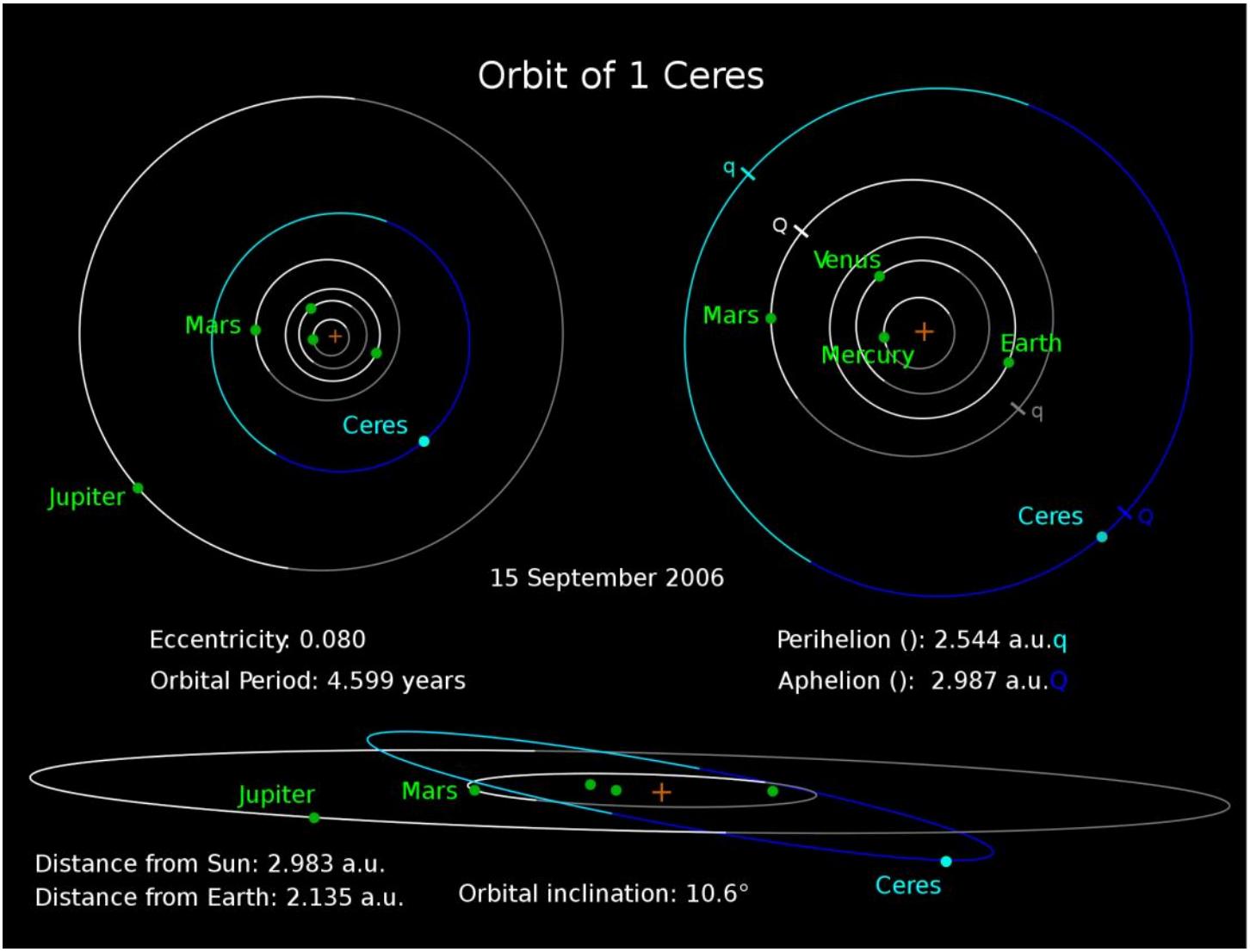

Above: The diagram illustrates the orbits of Ceres (blue) and several planets (white/grey). The segments of orbits below the ecliptic are plotted in darker colors, and the orange plus sign is the Sun's location. The top left diagram is a polar view that shows the location of Ceres in the gap between Mars and Jupiter. The top right is a close-up demonstrating the locations of the perihelia (q) and aphelia (Q) of Ceres and Mars. Interestingly, the perihelia of Ceres (as well as those of several other of the largest main belt asteroids) and Mars are on the opposite sides of the Sun. The bottom diagram is a perspective view showing the inclination of the orbit of Ceres compared to the orbits of Mars and Jupiter. Image credit: Orionist

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