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Spaceport News

John F. Kennedy Space Center - America's gateway to the universe

Twin GRAIL spacecraft to map the moon's gravity

By Anna Heiney
Spaceport News

Humans have studied the moon for hundreds of years -- first with telescopes, then with robotic probes, even sending 12 American astronauts to the lunar surface. But many mysteries remain.

The Gravity Recovery and Interior Laboratory mission, or GRAIL, features twin spacecraft embarking on a challenging mission to map the moon's gravity.

"Trying to understand how the moon formed, and how it evolved over its history, is one of the things we're trying to address with the GRAIL mission," says Maria Zuber, principal investigator for GRAIL from the Massachusetts Institute of Technology. "But also, (we're) trying to understand how the moon is an example of how terrestrial planets in general have formed."

"GRAIL is a mission that will study the inside of the moon from crust to core," Zuber said.

The mission is set to depart from Space Launch Complex 17B at Cape Canaveral Air Force Station in Florida on Sept. 8 at 8:37 a.m. Prelaunch processing -- and the final countdown -- are managed by NASA's Launch Services Program (LSP) at nearby Kennedy Space Center.

"Our team, especially, gets excited whenever we leave Earth orbit, and going to the moon excites us and excites the public," says LSP's Tim Dunn, the NASA Launch Manager for GRAIL.

The two spacecraft -- called GRAIL-A and GRAIL-B -- are riding into space side-by-side aboard a powerful Delta II Heavy rocket built by United Launch Alliance.

The GRAIL spacecraft together weigh about 1,600 pounds. Each unit is about the size of a washing machine, designed to be compact and rugged.

CLICK ON PHOTO *NASA/Jim Grossmann*

The second half of the clamshell-shaped Delta payload fairing swings into place around NASA's twin Gravity Recovery and Interior Laboratory (GRAIL) spacecraft under the scrutiny of a spacecraft technician at Space Launch Complex 17B on Cape Canaveral Air Force Station in Florida on Aug. 24. For more information, click on the photo.

"Whenever you have two spacecraft, it does increase the amount of work you have to do," explains Bruce Reid, the GRAIL mission manager for LSP.

"Both spacecraft have to go through environmental testing. And then, for instance, on launch day, we have two dedicated teams -- one to GRAIL-A and one to GRAIL-B."

After the climb to orbit, the GRAIL spacecraft will be released from the launch vehicle one at a time.

GRAIL's journey to the moon will take three-and-a-half months, offering plenty of time for controllers to enure the spacecraft are ready to work. The 42-day launch window opens Sept. 8, but regardless of the liftoff date, GRAIL-A will reach the moon on New Year's Eve of 2011; GRAIL-B will follow on New Year's Day of 2012.

Each spacecraft will execute a 38-minute lunar orbit insertion burn to slip into lunar orbit, then spend the next five weeks reducing their orbit period. Finally, the twin orbiters will be maneuvered into formation, kicking off the mission's three-month science phase.

During the next 82 days, the moon will rotate three times as the GRAIL spacecraft calculate the gravity they encounter. Each 27-day rotation is called a "mapping cycle."

"The lead spacecraft will accelerate, speed up, in response to a mass and cause the distance between the two to increase," Zuber said. "Then, as the second spacecraft comes over this greater mass, it will speed up and get closer to the first spacecraft. So we're essentially taking the distance between two points, and watching how that distance changes."

The GRAIL mission also marks the first time students have a dedicated camera on board a planetary spacecraft. The digital video imaging system, called MoonKAM, will offer middle-school students the chance to request photography of lunar targets for classroom study. The project is headed by Dr. Sally Ride, the first American woman to fly in space.

The path from the Earth to the moon has been well traveled by pioneers like Surveyor, the Apollo astronauts, Lunar Prospector and many more. Today, GRAIL is ready to take its place in this long line of lunar explorers.

"I'm going to be passing Complex 17 about 3:30 a.m. on my way to console," Dunn said about launch day. "And that hour of the morning, looking off to the east, seeing the rocket bathed in spotlights . . . It's an emotional time for all of us on the launch team."

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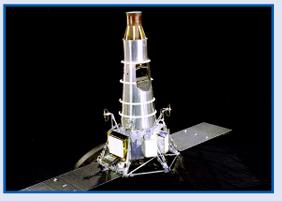
HERITAGE: Ranger 1



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Helicopter exercise tests emergency response

By Melanie Carlson
Spaceport News

On Aug. 31, the same day the Space Shuttle Program officially came to an end, the Shuttle Landing Facility (SLF) at NASA's Kennedy Space Center, Fla., was the focus of an emergency exercise looking toward future operations at the runway. After all, the SLF is still a functioning airport -- one that continues to serve exotic aircraft and act as the arrival point for cutting edge NASA satellites and spacecraft.

Kennedy's Flight Operations and Safety offices conducted the simulated helicopter accident to evaluate emergency response and mishap investigations of aircraft at Kennedy.

"We are looking to see and evaluate procedures and test communications among all the exercise participants at KSC," Kennedy's Aviation Safety Inspector Sam Rogers said.

A Huey II helicopter was used in this "real time" training exercise, complete with real smoke and fake casualties. More than 50 personnel from various Kennedy directorates participated in the simulated mishap that included eyewitnesses, casualty victims and evaluators. Don Doerr and Dr. Philip Scarpa evaluated and assisted crash victims, while a mannequin served as a fatality to evaluate notification procedures.

"Many agencies involved have less people and less depth, so this is an excellent operation to exercise the posture as it stands today," Kennedy's Chief of Flight Operations Tom Friers said. He added that training is a critical step in maintaining capabilities required in a viable airfield.

NASA mandates that an airfield emergency plan exercise be conducted every two years. During off years, policies and procedures are reviewed by managers via "tabletop training."

Various other Kennedy participants included: Air Rescue Fire Fighters (ARFF), Flight Operations, Disaster Preparedness, Security, and Safety.

Later that afternoon, a review conference was held to document findings and review lessons learned.

Friers said, "As shuttle has gone away, it is important to know the SLF airport is transitioning to support other customers in aviation and aerospace."

NASA/Kim Shiflett

NASA Fire Rescue personnel assist volunteers portraying injured Huey II helicopter crew members participating in the aviation safety exercise during Emergency Response Safety Training at the Shuttle Landing Facility, Runway 33, at Kennedy Space Center on Aug. 31.

NASA/Kim Shiflett

Participants in the aviation safety exercise during Emergency Response Safety Training included Air Rescue Fire Fighters, Flight Operations, Disaster Preparedness, Security, and Safety. NASA mandates simulated aviation safety training take place every two years. The simulated helicopter mishap exercise was conducted to evaluate emergency response and mishap investigations of aircraft on Aug. 31.

NASA's Commercial Crew Program takes next steps

By Linda Herridge
Spaceport News

NASA's new Commercial Crew Program (CCP) is up and running at Kennedy Space Center, and under the leadership of Program Manager Ed Mango and a team of NASA and commercial partner engineers, will take giant steps to pursue the development of a commercial capability to low earth orbit and ultimately transport crew back to the International Space Station.

"This program will allow others at NASA to move toward exploration beyond low-earth orbit," Mango said.

According to Mango, CCP objectives include maturing the design, development, demonstration and certification of U.S. commercial crew space transportation capabilities and providing technical assurance to support certification of commercial space transportation systems.

Mango said that NASA will be intimately involved in the design and development of launch and spacecraft systems to ensure safety.

"The initial design work is going on now," Mango said. "We would like to move into critical design within the next couple years and then into certifications and flights by the middle of the decade."

The center will assist commercial partners and provide them access to NASA's technical expertise and resources for development issues.

Maria Collura, acting deputy director for CCP said, "NASA brings over 50 years of human spaceflight experience and lessons learned that we want to ensure are part of the design, development and certification efforts associated with the commercial capability."

"We plan to implement an innovative approach to ensure that we limit the safety risks while also allowing industry to use their extensive engineering practices and experience in developing commercial human spaceflight systems," Mango said.

NASA previously awarded $50 million in Space Act Agreements during the first phase of the Commercial Crew Development and $270 million during the second phase.

Industry partners selected during the two phases were Blue Origin in Seattle; The Boeing Co. in Seattle; Paragon Space Development Corporation in Tucson, Ariz.; Sierra Nevada Corp. in Sparks, Nevada; Space Exploration Technologies in Hawthorne, Calif.; and United Launch Alliance in Denver.

Mango said the CCP also is establishing relationships with key NASA stakeholders including mission directorates, other centers, NASA programs and technical authorities. CCP also is creating interfaces with the U.S. Air Force and the Federal Aviation Administration (FAA).

Collura said one of CCP's primary objectives is to develop agreements among government entities to clarify roles and responsibilities and ensure that a balance between public and crew safety is achieved.

While NASA's role in CCP will include mission assurance and crew safety, Mango said the FAA will develop the crew safety regulations and compliance standards and collaborate with the Air Force and CCP on common standards and compatibility of requirements.

CCP will host a follow up Industry Forum webcast from Kennedy this month with a goal of collecting diverse input on commercial crew development in order to move closer to integrated design concepts.

"We've always been looking for feedback from industry," Mango said. "We are committed to this communication between CCP and industry as we move forward."

Reuse, reliability will launch future, expert's study shows

By Steven Siceloff
Spaceport News

Driving down the price of taking people and cargo into space or to the other side of the world in two hours will depend on developing a system so reliable and reusable that a thousand flights or more can take place in a year, a space launch expert told a group of engineers and others Aug. 31 at Kennedy Space Center.

It's not a launch scenario envisioned for the immediate future, but it could develop in the decades afterward, Jay Penn of Los Angeles-based The Aerospace Corporation said during his "Beyond Next Generation Access to Space" presentation. The company studied potential business cases for pursuing different launch strategies.

The cost of taking a pound of anything into space ran about $10,000 aboard the space shuttle, but that price tag would fall dramatically if space agencies and companies model their research on developing launch systems on the commercial airline and air cargo industries, Penn said.

"Commercial aircraft operate at $2 to $3 per pound of payload around the world, but space is 5,000 times that," Penn said.

Getting the space transportation business down to that cost means building vehicles that are designed for operability – that is much less maintenance between flights with rapid turnaround to support much higher flight rates. Evolving systems that deliver people and cargo to anywhere on the planet in less than two hours, for example, will need to make multiple trips in the same day and operate out of three or more hubs around the world.

His study has shown that some new applications could emerge in the coming years to accelerate the demand for frequent and lower cost access to space. In fact, the development of such reusable and operable systems will require the promise of higher demand to justify their development. Among the markets that could provide that spark are orbital space tourism, even limited demand for space-based solar power generation, and high speed transport services to travel from point-to-point on the planet.

"That's where you need to spend your energy, to make aircraft-like operations for these kinds of vehicles," Penn said.

Kennedy, with unique facilities such as the Vehicle Assembly Building and a runway long enough to host space-going vehicles, could find itself in key support roles for the new spacecraft.

Jim Ball, the deputy of Kennedy's Center Planning and Development Office, said his office is leading the effort to craft a future development concept and revised master plan for KSC to position it for future needs. The plan will provide a guide for the overall development of the center for the next several decades, Ball said.

Penn's study was not necessarily a prediction of where the space launch industry will be in the coming decades as much as a look at what it could be. For now, NASA is focused on a budding commercial industry aiming to launch cargo and astronauts to the International Space Station. The agency is also working toward a launch and space infrastructure supporting astronauts on missions to an asteroid, the moon or Mars.

So what would the spacecraft look like that could accomplish an unprecedented flight rate? Well, it would have a large first stage booster with wings and landing gear so it could land on a runway. It would weigh about as much as today's jumbo jets but may be a bit smaller.

The booster's main engines would operate on existing fuels, either kerosene or liquid hydrogen and it might even make its own

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2011 NASA Kennedy Honor Awards

NASA/Jim Grossmann

Kennedy Space Center hosts its annual Honor Awards ceremony Aug. 16, in the IMAX Theater at the Kennedy Space Center Visitor Complex. During the ceremony, NASA and contractor employees and work teams were recognized for contributions they made to the center and to the agency during 2011.

Distinguished Public Service Medal

Awarded to any individual who was not an employee of the Federal Government or was not a Government employee during the period in which the service was performed. The award is granted only to individuals whose distinguished accomplishments contributed substantially to the NASA mission. The contribution must be so extraordinary that other forms of recognition would be inadequate. This is the highest honor that NASA confers on a non-Government individual.

Honorable Mention

Daniel J. Ciccateri,
United Space Alliance
Richard E. Harvey
United Space Alliance
Dennis R. Weaver
ASRC Aerospace, Inc.

Individual KSC Honor Awards

KSC Certificates of Commendation

This award recognizes exceptional individual accomplishment or outstanding direction or management of a program or program segment, which affects the entire Center or contributes significantly to the Center's mission.

Michael A. Bell
James S. Bolton
Andrew J. Bradley
Matthew A. Bzura
John H. Calvert
Richard J. Carrillo
Penny L. Chambers
Janis E. Clark
Troy D. Cochran
Adam S. Dalton
Ray E. Davis
Jason W. Dehler
Denton K. Gibson
John J. Giles
Nancy W. Hoffman
Melanie D. Huss
Anne C. Jamison
Melissa S. Jones
Charmel L. Jones
Clifton W. Lanham
Douglas R. Lenhardt
Joseph J. Mahon
Elaina M. McGhee
Gail G. McLean
Timothy W. Morris
Kim F. Myrick
Janice M. Nieves
Behrouz F. Pashaee
Michael R. Payne
Jeffrey W. Sampson
Edsel C. Sanchez
Edgardo Santiago-Maldonado
Roland Schlierf
David C. Schultz
Donald R. Slayman
Christopher A. Spears
Robert A. Stute
Carlos E. Suarez
David A. Sumner
Margaret A. Truitt
Daniel R. Whitworth

KSC Equal Opportunity Award

This award is granted for outstanding contributions to Equal Opportunity. Examples of the types of contributions for which the award may be granted include: encouraging self-development and training among minorities and women; assigning minority and women employees to organizational tasks which broaden their experience; suggesting affirmative action's which alleviate problems peculiar to minorities and women; and, assigning minorities and women to tasks which encourage full utilization of their skills.

In the category of supervisory:

Becky J. Thompson

In the category of non-supervisory:

Paul A. Mogan

KSC Quality and Safety Achievement Recognition (QASAR) Award

The award recognizes individual government and contractor employees at NASA Headquarters and Centers who have demonstrated exemplary performance in contributing to the quality and/or safety of products, services, processes, or management programs and activities.

In the category of: Lifetime Achievement

Christopher J. Nagy
(KSC Safety and Mission Assurance)

In the category of: Most significant quality or safety contribution from within the NASA Safety and Mission Assurance organization, as a civil servant.

John J. Branard
(KSC Safety and Mission Assurance)

In the category of: Most significant quality or safety contribution external to the NASA Safety and Mission Assurance organization, as a civil servant.

Becky J. Thompson
(KSC Launch Vehicle Processing)

In the category of: Most significant quality or safety contribution from within the NASA Safety and Mission Assurance organization, as a contractor.

Donald R. Clarkson
(Millennium Engineering and Integration)

In the category of: Most significant quality or safety contribution external to the NASA Safety and Mission Assurance organization, as a contractor.

Patricia J. Stratton
(United Space Alliance)

Individual NASA Honor Awards

NASA Equal Employment Opportunity Medal

Is awarded to both Government and non-Government individuals for outstanding achievement and material contribution to the goals of NASA's Equal Employment Opportunity Programs either within the Government or within the community organizations or groups.

Ronald E. Schoen

NASA Exceptional Achievement Medal

This award is given for a significant contribution, specific accomplishment, or contribution clearly characterized by a substantial or significant improvement in operations, efficiency, service, financial savings, science, or technology which contributes to the mission of NASA.

Thomas J. Aranyos
Aimee L. Bergquist
Chad E. Brown
Laurette L. Brown
Tammy S. Burlein
Henry Bursian
Stephen P. Ernest
Linda D. Euell
Christopher A. Gerace
Tracy R. Gill
Douglas J. Gruendel
Lisa T. Haber
William E. Larson
John R. Lorch
Sandra A. Massey
Alicia C. Mendoza
Brian M. Nufer
Jennifer M. Nufer
Jessica Parsons
Julie J. Peacock
James R. Rogers
Rayelle E. Thomas
Michael E. Woltman

NASA Exceptional Engineering Achievement Medal

An award given for exceptional engineering contributions toward achieving the NASA mission.

Kimberly B. Demoret
Megan K. Jaunich
Ping Y. Yu

NASA Exceptional Service Medal

This award is granted for significant performance characterized by unusual initiative or creative ability that clearly demonstrates substantial improvements or contributions in engineering, aeronautics, space flight, administration, support, or space-related endeavors which contribute to the mission of NASA.

Jeffrey J. Angermeier
Deborah B. Bayline
Tamara L. Belk
John J. Branard
Gennaro Caliendo
Peter J. Chitko
Henry L. Collier
Maria A. Collura
Andreas W. Dibbern
Carlos D. Estrada
Steven M. Lewis
Ronald G. Mueller
Mark K. Ruether
Dean O. Schaaf
Sallie J. Studds
Stephen J. Swichkow
Harold H. Turner
Kenneth B. Whitt
Connie Wilcox
Lisa M. Williams
Robert A. Yaskovic

NASA Exceptional Public Service Medal

Is awarded to any individual who was not a Government employee during the period in which the service was performed. This award is granted for exceptional contributions to NASA's mission.

Wayne W. Bingham
William E. Carr
Kerry J. Chreist
Arthur H. Edwards
Debra J. Gray
Tammy S. Kimmell-Hammond
Linda L. Matthias
Elizabeth A. Muldowney
Patricia G. Overstreet
Ronald D. Ten Haken
Jeffrey L. Van Pelt

NASA Outstanding Leadership Medal

This is awarded for notably outstanding leadership which affects technical or administrative programs of NASA. The leadership award may be given for an act of leadership, for sustained contributions based on a leader's effectiveness, for the productivity of the leader's program, or for the leader's demonstrated ability in developing the administrative or technical talents of other employees.

Steven G. Brisbin
Steven R. Brunelle
Gregg A. Buckingham
Rosa N. Caudle
Gregory R. Clements
Robert M. Ellison
Douglas A. England
Shawn M. Greenwell
Terri L. Holbert
Rechea H. Hutchinson
George W. Jacobs
Jennifer C. Kunz
Ronnie R. Lawson
Joseph E. Madden
Launa M. Maier
Cheryl A. Malloy
Richard A. Mizell
Adalberto Sierra
Scott B. Thurston

NASA Group Achievement Award

A team award given to a group of Government employees or a group comprised of both Government employees and non-Government personnel for outstanding accomplishment through the coordination of many individual efforts, which has contributed substantially, to the NASA mission, with explicit consideration given to: (1) the quality of results and the level of impact on NASA programs or operations; (2) effective management of cost and schedule; (3) customer satisfaction; (4) team growth and capacity for future contribution; and (5) additional credit for development of innovative approaches, use of and contributions to lessons learned data banks, and/ or success in responding to unforeseen crises.

21st Century Space Launch Complex
Accepting for this team is Robert D. Waterman, NASA

Agency Data Center Consolidation Team
Accepting for this team is Deborah B. Diaz, NASA HQ

Alpha Magnetic Spectrometer Payload Team
Accepting for this team is Jack P. Keifenheim, NASA

Ares V Transporter Trade Study Team
Accepting for this team is Charles A. Gambaro, NASA

ARRA Team
Accepting for this team is Ned A. Voska, NASA

Ceramic Plug Redesign Team
Accepting for this team is Michael R. Lind, United Space Alliance

Constellation Ground Systems Business Support Team
Accepting for this team is Luke Hoffman, NASA

Constellation Ground Systems Launch Control System
Accepting for this team is Kirk D. Lougheed, NASA

Crawler Transport Team
Accepting for this team is William J. Couch, United Space Alliance

CxP Command and Control Systems Engineering Team
Accepting for this team is Curtis C. Dugger, NASA

CxP Ground Subsystems Systems Engineering Team
Accepting for this team is Roger E. Mathews NASA

Design and Construction Team (VAB Doors)
Accepting for this team is Eugene Hajdaj, NASA

Design and Deconstruction Team
Accepting for this team is Sonia S. Miller, NASA

Electrical Power Modifications Team
Accepting for this team is Sudhir S. Mehta,NASA

External Tank Stringer Repair Access Team
Accepting for this team is David A. Schuermann, United Space Alliance

Falcon 9 Avionics Qualification Assessment Team
Accepting for this team is John W. Speck, NASA

Inaugural Lunabotics Mining Competition Team
Accepting for this team is Gloria A. Murphy NASA

ISLO-ISRU 2010 FIELD TEST TEAM
Accepting for this team is Janine F. Captain, NASA

Kennedy Space Center Remediation Team
Accepting for this team is Jennifer M. Levitt, NASA

Kennedy Space Center Task Order Request Team
Accepting for this team is Janet F. Letchworth, NASA

Launch Equipment Test Facility Project Team
Accepting for this team is Eric W. Ernst, NASA

Launch Services Program Pricing Tool Team
Accepting for this team is Fernan Rodriguez-Ortiz, NASA

LCS FR 1 Phase 1 Installation and Test Team
Accepting for this team is Melanie S. Clegg, NASA

LCS Information Architecture Trade Study Team
Accepting for this team is Adam S. Dalton, NASA

NASA Launch Services II Team
Accepting for this team is Jennifer W. Lyons, NASA

Propellants North Design and Construction Team
Accepting for this team is Francis X. Kline, NASA

Prototype FIRST Robotics Lab Team
Accepting for this team is Michael D. Dininny, NASA

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2011 NASA Kennedy Honor Awards

From **AWARDS**, Page 5

Repair Crawlerway – Rock Replacement Team
Accepting for this team is Justin D. Junod, NASA

Requirements Management Meeting Managers Team
Accepting for this team is Renee A. Curry, United Space Alliance

Solid Rocket Processing Element Team
Accepting for this team is Bao T. Nguyen, NASA

Support Action Center Team
Accepting for this team is Kerry J. Chreist, United Space Alliance

VAB Team
Accepting for this team is Edsel C. Sanchez, NASA

NASA Public Service Group Achievement Award

A team award given to a group of non-Government personnel for an outstanding accomplishment while participating in a significant program or project that has contributed substantially to NASA's mission, with explicit consideration given to: (1) the quality of results and the level of impact on NASA programs or operations; (2) effective management of cost and schedule; (3) customer satisfaction; and (4) additional credit for development of innovative approaches and/or success in responding to unforeseen crises.

United Space Alliance Fuel Farm Team
Accepting for this team is David J. Cain, United Space Alliance

Distinguished Service Medal

The highest honor that NASA confers. It may be awarded to any person in the Federal service who, by distinguished service, ability, or courage, has personally made a contribution representing substantial progress to the NASA mission. The contribution must be so extraordinary that other forms of recognition would be inadequate.

Honorable Mention

James E. Fesmire
Christopher J. Nagy

Individual KSC Honor Awards

KSC Strategic Leadership Award

This award embodies the future direction of KSC through demonstrated leadership and initiative, drive, breakthrough performance and change; production of results; action on problems and implementation of solutions; and, supporting, encouraging, and motivating others to make forward choices on behalf of NASA and KSC. It recognizes and motivates employees' commitment in supporting and implementing the Agency, enterprise, strategic plans, and the KSC Implementation Plan. This award may be granted to any NASA/KSC employee, except Senior Executive Service.

Hortense B. Burt

KSC Director's Award

This is the highest award that the Center confers on an employee. The award honors an employee who has exemplified through personal effort and innovation the highest standards and commitment to the application of continual improvement principles and practices or for the accomplishment of a job-related task of such magnitude and merit as to deserve special Center recognition.

Joyce M. Riquelme

2010 Presidential Rank Award

Each year, the President recognizes and celebrates a small group of career Senior Executives with the President's Rank Award for exceptional long-term accomplishments. Winners of this prestigious award are strong leaders, professionals and scientists who achieve results and consistently demonstrate strength, integrity, industry, and a relentless commitment to excellence in public service. There are two categories of rank awards: Distinguished and Meritorious. Award winners are chosen through a rigorous selection process. They are nominated by their agency heads, evaluated by boards of private citizens, and approved by the President. The evaluation criteria focus on leadership and results.

Meritorious Executive

Scott D. Kerr
Ruth G. Caserta Gardner
Michael J. Bolger

From **BEYOND**, Page 3

oxygen in flight. Penn emphasized using fuels that can be handled easily on Earth between flights, and both kerosene and hydrogen have a long history of safe handling and remote loading.

The second stage would be either a similar winged booster with a small cargo bay, or a second stage holding a satellite. If the design is versatile enough, then two first stage boosters could be combined to launch a particularly large payload.

Getting that kind of design will start with combining new technologies rather than trying to come up with a single revolutionary invention, Penn said. Pulse detonation engines powering a Waverider-type craft made from carbon nanotubes would be a possible combination.

Designers also must focus on modular concepts that give operators flexibility. But mostly, they need to come up with space-worthy craft that operate like airplanes, with one kind designed for space operations and another destined to fly in and out of the atmosphere without going into orbit for carrying passengers and cargo between destinations on earth.

"It's going to be very challenging to build one vehicle to do both roles," Penn said.

In both cases, Penn said it is not necessarily an advantage to design a spacecraft that takes off from a runway like an airplane because additional weight would mean the craft would weigh up to three times more than a 747 or A380.

There is also the prospect of space tourism, he believes, with most of the demand being for going into orbit instead of just going into space briefly.

"We think there's a sweet spot where you can have 1,000 flights a year and get the ticket prices down to the point where people will want to pay," Penn said.

His advice for the future development of KSC? Be flexible and ready to adapt to these potential future markets that could dramatically increase flight rates and spur the development of vehicle systems that require much faster turnaround, and efficient ground servicing.

Scenes Around Kennedy Space Center

CLICK ON PHOTO *NASA/Jerry Nagy, VAFB*

The environmentally controlled transportation container holding NASA's National Polar-orbiting Operational Environmental Satellite System Preparatory Project (NPP) satellite comes to rest on the floor of the Astrotech payload processing facility on Vandenberg Air Force Base in California on Aug. 30. NPP represents a critical first step in building the next-generation of Earth-observing satellites. NPP will carry the first of the new sensors developed for this satellite fleet, now known as the Joint Polar Satellite System (JPSS), to be launched in 2016. NPP is the bridge between NASA's Earth Observing System (EOS) satellites and the forthcoming series of JPSS satellites. The mission will test key technologies and instruments for the JPSS missions. NPP is targeted to launch Oct. 25 from Space Launch Complex-2 aboard a United Launch Alliance Delta II rocket. For more information, click on the photo.

Remembering Our Heritage

Ranger 1 set the stage 50 years ago for lunar missions

By Kay Grinter
Reference Librarian

The stage was set in Cape Canaveral 50 years ago for NASA's upcoming GRAIL lunar mission with the launch of Ranger 1, NASA's first flight test of a lunar spacecraft.

Ranger 1, carrying experiments to investigate cosmic rays, magnetic fields and energetic particles, lifted off Aug. 23, 1961, aboard an Atlas-Agena rocket from Launch Pad 12 into a parking orbit.

A modified Atlas D served as the rocket's first stage, and an Agena B, as the second.

NASA's first attempt to launch a spacecraft from an orbiting platform was only a limited success, however, as the Agena B apparently failed to restart. Ranger 1 did not have sufficient escape velocity, resulting in Ranger 1 being stranded in low-Earth orbit.

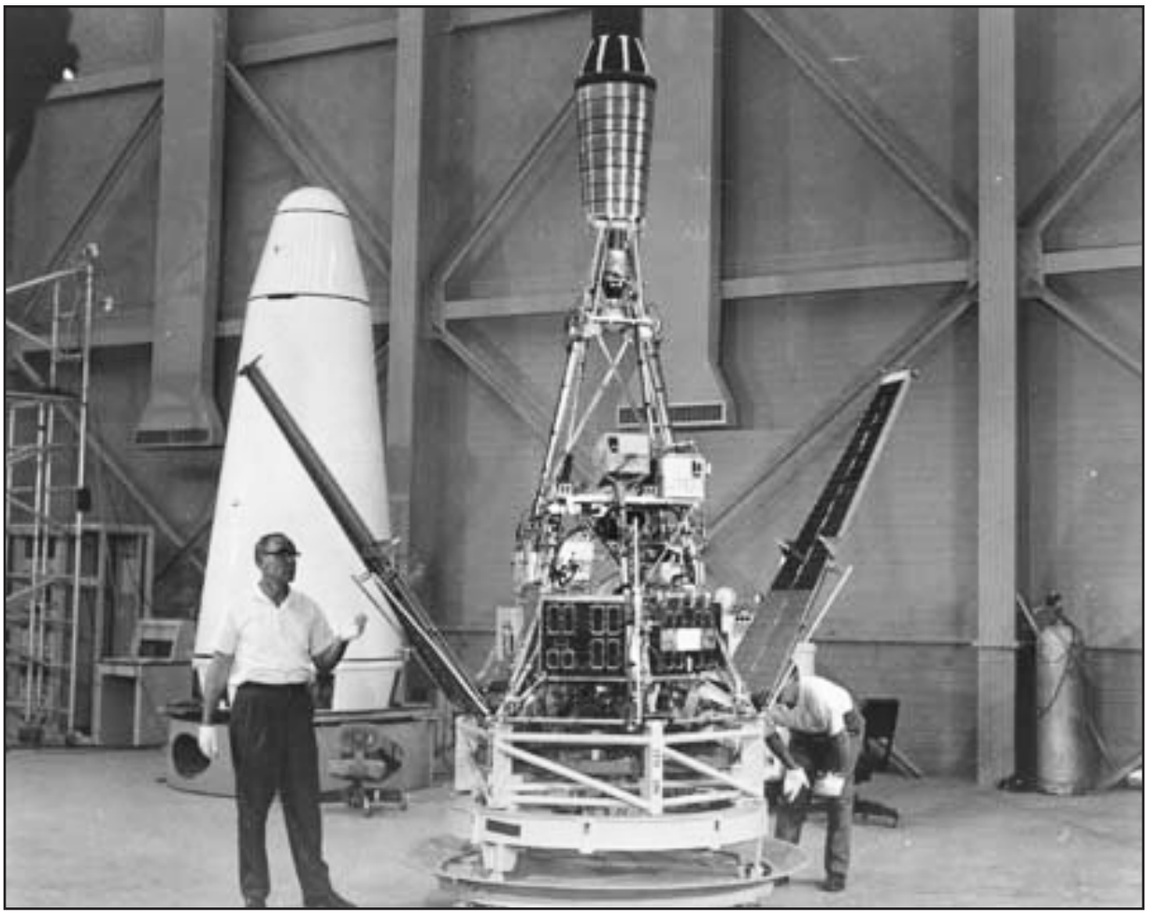
The primary test objective largely was accomplished, but only limited data was gained from the scientific experiments.

The Ranger Program was set in motion in 1959 and the establishment of a lunar goal kicked it into high gear. Its purpose was to obtain high resolution photographs of the lunar surface. The very best photographs available in the early 1960s had a resolution of only 1,000 feet -- one-fifth of a mile.

The Ranger spacecraft were designed to intercept the moon, taking television pictures and transmitting them back to Earth in an electronic stream during the final moments of their plunge toward destruction.

NASA file/1964

Ranger 7 took this image, the first picture of the moon by a U.S. spacecraft, on July 31, 1964.



NASA file/1964

The Ranger fleet of spacecraft launched in the mid-'60s and provided for the first time live television transmissions of the moon from lunar orbit. These transmissions resolved surface features as small as 10 inches across and provided more than 17,000 images of the lunar surface. These detailed photographs allowed scientists and engineers to study the moon in greater detail than ever before thus allowing for the design of a spacecraft that would one day land men of Earth on its surface.

The results of the first six Ranger missions were disappointing due to launch vehicle or spacecraft failures, and NASA's credo was put to the test: failure was not an option.

After Ranger 1 was stranded in a parking orbit, the Agena's failure to reignite later again left Ranger 2 in a lower orbit than planned in 1961.

Early in 1962, a combination of launch vehicle and spacecraft problems caused Ranger 3 to miss the moon by 22,862 miles and resulted in the spacecraft entering solar orbit.

Control of Ranger 4 was lost two hours after launch, but tracking indicated it made the first U.S. lunar impact on the far side of the moon April 26, 1962.

Later that year, failure to generate solar power caused the batteries on Ranger 5 to die nine hours after launch. It missed the moon by 450 miles and continued into solar orbit.

In 1964, Ranger 6 struck the moon within 20 miles of its planned impact point in the Sea of Tranquility, but arcing within the TV system's high voltage power supply system during the launch phase rendered the imaging system inoperable.

Not until Ranger 7 was launched July 28, 1964, was success achieved. The flight was flawless, and in a little more than 68 hours after launch, the spacecraft's six TV cameras were turned on as it plunged down toward a small "sea" near the crater Tycho.

The results were worth the wait. Ranger 7 transmitted a stream of more than 4,300 images during its plunge down to the pockmarked lunar surface.

The late Robert Gray was NASA's director of Unmanned Launch Operations at Kennedy Space Center during the Ranger era. Program requirements "pushed the technology of the time," he said. The programs "posed some fascinating guidance and tracking problems."

"We were also limited in the days we could launch each month," he recalled, "and the precision demanded in getting into the required trajectories imposed some very short launch windows.

In 1965, the learning curve conquered, the successful Ranger 8 transmitted 7,137 TV pictures back to Earth followed by another 5,814 returned by Ranger 9.

"Many surveys had to be conducted of the moon to make sure that astronauts could land there," Gray said, "and there was a lot of hardware already on the moon when the Apollo crews arrived."

Space Shuttle Program ends

Spaceport News thanks all the workers who supported NASA's Space Shuttle Program, which officially ended Aug. 31.

The agency's Space Shuttle Transition and Retirement Office now will lead all space shuttle work, including overseeing the preparation of the four shuttles for public display at national museums.

The office will also make sure unneeded facilities and property are closed down, sold or made available to new users.

CLICK ON PHOTO *NASA/Frankie Martin*

Technicians transport Engine No. 1, the final engine removed from space shuttle Atlantis, to the Engine Shop for possible future use Aug. 22. For more information, click on the photo.

45th Space Wing welcomes new general as commander

For Spaceport News

Aug. 31 was a pretty good day for Brig. Gen. (select) Anthony Cotton.

At 8 a.m., he was promoted to the rank of Brigadier General. About 30 minutes later, he assumed command of the 45th Space Wing from outgoing commander, Brig. Gen. Ed Wilson in back-to-back ceremonies held at Patrick Air Force Base.

Not a bad way to start the day.

The promotion ceremony was presided over by and Lt. Gen. (Ret.) Robert Hinson. Lt. Gen. Susan Helms, currently the 14th Air Force commander, Vandenberg Air Force Base, Calif., presided over the change of commander ceremony. Both are former commanders of the 45th Space Wing as well.

Photo courtesy of U.S. Air Force

Lt. Gen. Susan Helms, left, current commander of the 14th Air Force, passes the 45th Space Wing Guidon to Brig. Gen. Anthony Cotton during the change of command ceremony Aug. 31 at Patrick Air Force Base. In the background is Chief Master Sgt. Calvin Williams, the wing's command chief.

"Coming back here as the commander of the world's greatest space wing is the culmination of a dream for all of us," Gen. Cotton said. "What makes today even better is having all these friends and family and role models who are here to share this day with us," he said.

"Marsha (his wife) and I have great memories from our last tour here, and we look forward to expanding on those during this assignment," he said with a knowing smile.

From June 2001 to March 2004, Gen. Cotton wore three different hats here. He served as the Operations Officer, 45th Range Squadron, the Commander, 3rd Space Launch Squadron, and the Deputy Commander, 45th Operations Group.

Lt. Gen. Helms, a well-known former NASA astronaut, who was just inducted into the U.S. Astronaut Hall of Fame last May, said Gen. Cotton is the perfect person to take the helms from Gen. Wilson.

"Having someone with General Anthony Cotton's reputation and experience here makes him the perfect officer to lead this great wing," said Lt. Gen. Helms. "He knows how to lead from the front, he knows what he's doing, he knows the mission of the 45th, and he knows he's going to be working with some very talented, very devoted people here," she said.

Christopher Calkins of the 45th Space Wing Public Affairs wrote this report. The U.S. Air Force photo is by Matthew Jurgens.

Looking up and ahead . . .

* All times are Eastern

Sept. 8	Launch/CCAFS: Delta II Heavy, GRAIL; Launch: 8:37 a.m. or 9:16 a.m.
Oct. 25	Launch/VAFB: Delta II, NPP; Launch window: 5:48 to 5:57 a.m.
No Earlier Than Nov. 7	Launch/CCAFS: Delta IV, WGS 4; Launch window: TBD
No Earlier Than Nov. 25	Launch/CCAFS: Atlas V, Mars Science Laboratory; Launch: 10:21 a.m.
No Earlier Than Nov. 30	Launch/CCAFS: SpaceX Falcon 9, Dragon C2/C3; Launch window: TBD

John F. Kennedy Space Center

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