



AD ASTRA KANSAS NEWS

NASA 50th...

Lyons man's helicopter retrieved Alan Shepard

When 24-year old 1st Lt. Wayne Koons, Marine Air Group Twenty-Six, was called into his colonel's office in February of 1959 the Lyons native was intrigued. The topic was sending a man into space.

October 1, 2008, marked the fiftieth anniversary of NASA's first day of operation. Four months later, the helicopter pilot with a degree in physics and math degree from Ottawa University, Ottawa, Kans., was part of the space race. His team's mission was to develop a process for retrieval of spacecraft flown in the new U.S. space program.

"The assignment was challenging, [so I] was not a bit reluctant, says Koons, who by the time of Alan Shepard's suborbital flight in May of 1961 had become the Mercury Project Officer for Retrieval. He also was the pilot of Shepard's recovery helicopter.

Two and a half years of preparation included developing a process for helicopter deployment from the carrier (an unplanned last-minute vessel switch) to cover an area as much as 100 miles off-target. These H34 helicopters were single engine w/ reciprocating engines and mechanical works. For reliability purposes, three would be sent out at 10-minute intervals.

For weight reasons, helicopters were stripped down from a three- to a two-man crew and all non-essential avionics and the life raft were removed, an eerie thing as a helicopter flew solo over open ocean. Navigation was done by dead reckoning using a plot board. Even the fuel load needed was calculated very precisely, says Koons from his home in Lyons.

The spacecraft's weight was supposed to be about 1700 pounds, though when an inflatable landing bag was added, water weight added 10,000 pounds. A helicopter's dry weight was only 10,500 pounds. "We handled that by lifting it and letting the water drain out with the copter on high power setting," says Koons.

Koons, as pilot with co-pilot George Cox in helicopter #44 retrieved Alan Shepard. They had a lead on the flight and were already in the air when the capsule dropped. As it splashed down only a few miles from the carrier they arrived immediately.

In an oral history recorded for NASA in 2004, Koons described the manipulations needed to retrieve a spacecraft. Coming upon a spacecraft the pilot had to twist his head out and down to keep the capsule in view, and maneuver close enough so the co-pilot's 12-foot pole with a four-braid stainless aircraft cable and a stainless steel hook could reach the loop on top of the capsule. The co-pilot holding the hook was braced in the helicopter hatch

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November meeting to explore Kansas space tech potential

As our state strives to develop an "environment for opportunity" as part of its 2007 Kansas Economic Development Strategic Plan, it counts technology and innovation as a key component of that plan. NASA's 2006 Strategic Plan calls for partnerships of various kinds to "help connect NASA to communities of innovators and leverage resources for mutual benefits."

That, coupled with the result of a survey done by the Ad Astra Kansas News is the catalyst for a meeting the Ad Astra Kansas Initiative will host Nov. 20 in Topeka for various state, business and university entities on the topic of space technology. A NASA representative has been invited.

The meeting will be exploratory, a discussion of what possibilities there might be for space as a

niche industry in Kansas.

Over a period of months, the News asked for opinions from parties with science interests about the state of space science and technology in Kansas. Input was given on strengths and weaknesses, political perspectives, funding, university and workforce issues. The results indicated an examination of this topic of space technology and/or a coordinated effort or focus in this area might be beneficial.

The meeting will be Thursday, Nov. 20, from 9 a.m. to 12 p.m. in the Simmerwell Room at the Kansas Museum of History, 6425 SW 6th Ave, Topeka. If interested in attending, contact Jeanette Steinert at 620-669-8558 or jeanettesteinert@att.net.

Robots wow at ICRA

Unconventional. Low-cost.

As the only entry utilizing multiple robots to accomplish tasks and by working within low-cost parameters, the University of Kansas School of Engineering entry at the 2008 IEEE International Conference on Robotics and Automation received a lot of notice.

The seven-person team of computer science graduate students earned first place awards in the ICRA Robot Challenge held at the conference last May.

"Our approach was considered unconventional. When we think about space robotics, we think of mobile robots like Spirit and Opportunity on Mars that independently investigate separate portions of the planet. Using multiple robots in planetary environments had been proposed, but not yet given the opportunity to perform, likely due to lack of reliability of such an approach. In the future, this may be the case and that is what we wanted to depict and investigate with our work," says team member and doctoral candidate Chris Gifford.

All other teams at the Robot Challenge, which included MIT and Cornell, as well as teams from Japan, Germany and Mexico, used a single robot. These robots were larger and also had expensive sensing and computing equipment systems. Some teams used laser-based range sensors which cost more than the KU team's entire system of robots. Some of the competition's robots were several years old. "We built our robots in a single semester, demonstrating the advantage of creating low-cost, low complexity mobile robots," says Gifford. Two teams had to withdraw because of robot technical problems. KU itself had some problems, but was able to reconfigure the robots and accomplish the tasks.

Because diversity of entries made comparison difficult, judges awarded on the basis of comple-

Continued Robots page 3

2008 Kansas SMARTT Conference Features Homer Hickam

The Kansas Association of Teachers of Mathematics (KATM) and the Kansas Association of Teachers of Science (KATS) are working together again to offer a statewide conference, SMARTT 2008, that focuses on the learning and teaching of mathematics and science using assessment, research and technology. For those interested in a TI-T3 conference, one will find that at SMARTT as well. There will be sessions each day focusing on TI technology – graphing calculators, Navigator, TI-Nspire in particular. Register for SMARTT 2008 and you can attend any of the T3 sessions, or register for T3 and attend any of the SMARTT sessions. There is only one registration fee and you can "mix and match" your sessions.

Featured speaker will be best-selling author (Rocket Boys / October Sky) and retired NASA engineer Homer Hickam who will open the conference at 1 p.m. on Thursday, November 6th.

Several outstanding math and science speakers will be presenting at SMARTT 2008. Among them are:

- * Adam Weiner, author of the best-selling book, Don't Try This at Home.
- * Dr. Ken Wesson will present "Brain-compatible Approaches for Teaching".
- * Dr. Kathleen Fulson is the Director of Reinventing Schools for the 21st Century, National Commission on Teaching and America's Future (NCTAF). Dr. Fulson will present "Teaching in the Digital Age: What it Means for Today's Math, Sci-

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Winners of the Randall

Chambers Ad Astra Kansas Award for Excellence in Engineering at the WSU Engineering Open House last May were: (starting second from the left) Sarah Stallard, Olga Devkota, Prasad Patil and Sumanth Pandith Surendra (not pictured). Shown extreme left is Jeanette Steinert AAKN editor. The project was "MetaData Enabled Thinking Systems Tool." We asked a few questions.

Q: A quick overview: "In a complex system, interdependencies in various requirements, if overlooked, may lead to malfunction and/or violation of system integrity. The systems-engineering-support tool under development aids systems engineers responsible for the design, realization, and support of complex technologically intensive systems that experience difficulty in managing the interdependencies in systems requirements. This tool helps engineers work with a range of stakeholders, each with their specific terminology, technical issues and decision responsibilities. The physical and operational requirements are developed using a spiral model of successive evolutionary steps in system realization.

Q: Most challenging part: "We needed to identify requirements, develop/verify solutions and validate the tool in order to meet as many of their needs as possible. This approach leads us to develop a functioning tool as early as possible, so the sponsors are able to use it as a collaborative means for clearly defining requirements for the deliverable.

Q: Most unique part: "Converting the database containing the interdependencies among various system entities to graphical form and converting the graphical representation of them back to the database."



Kansas Cosmosphere eyes podcasting

Education through cyberspace will take flight at the Kansas Cosmosphere and Space Center by the end of the year.

This will probably take the form of virtual tours of the Hall of Space, NASA updates and snippets of some of KCSC's live presentations, possibly some web-only content. "The demand is there and they want it now," says Joel Walker, vice-president of education at the KCSC. There have already been a number of requests for classroom presentations in both Texas and Kansas.

"I initially see educators as the target, but I can see this evolving to include folks interested in space exploration around the world. I would love to know that someone in Korea was looking at the Apollo 13 capsule [on display at the KSCS] while we all slept," says Walker.

One of the features of the Cosmosphere's new website is a blog by astronaut Stephen Bowen as he prepares for his mission (STS -126) scheduled in November. Go to www.cosmo.org

\$2.9 million awarded for science education program

LAWRENCE--University of Kansas researchers and graduate students will work to instill a love of science, math and engineering in K-12 students in Kansas.

The National Science Foundation has announced it will award \$2.9 million over five years to the Kansas Partnership for Graduate Fellows in K-12 Education Program at KU.

The program will bring highly qualified doctoral students in engineering and science into sixth- through ninth-grade classrooms in Topeka and Kansas City, Kan., with hands-on science experiences and innovative lessons to enhance student learning.

Specific aims include "improving the science achievement of at-risk middle school students in two of the largest urban districts in Kansas," said Dennis Lane, the program's leader, associate director of research and education for the KU Transportation Research Institute.

The program will also work to establish a sustainable outreach partnership among participating school districts and the KU Transportation Research Center and the Center for Remote Sensing of Ice Sheets (CRESIS).

On the Horizon. . . .

Nov. 1 Kansas BEST Robotics Competition for high schoolers at Koch Arena @ WSU. Theme: "Just PLANE Crazy"

Nov. 6-8 Kansas SMARTT Conference, Overland Park Convention Center, Overland Park

Nov. 20 Ad Astra Kansas / NASA Space-Tech Meeting, 9 a.m. to 12 p.m., Kansas Museum of History, Topeka

Nov. 20-21 Annual Four-States Regional Technology Conference at the Kansas Technology Center, Pittsburg

Nov. 21 Teachers Night Out @Kansas Cosmosphere and Space Center, Hutchinson with guest speaker former astronaut Winston Scott www.cosmo.org

Nov. 22 Public presentation and book signing by former astronaut Winston Scott @ Kansas Cosmosphere and Space Center www.cosmo.org

Please submit events to:
info@adastra-ks.org

Student finalist in Discovery Channel 3-M Scientist Challenge

Thirteen-year old Maggy Botros, Wichita, was a top-ten finalist in the nationwide The Discovery Channel 3-M Scientist Challenge held in Washington, D.C., Oct 5-6.

This year's theme was space science. The home-schooled seventh-grader's qualifying entry was a video on light refraction. At the event, finalists went through several rounds of space-related challenges and judged on their science skills and abilities to convey science knowledge to others. Botros won the "Star Gazer" Prize, a behind-the-scenes look at Lowell Observatory, Flagstaff, Ariz., and a \$1,000 prize. She and other finalists will be featured in a Science Channel special airing Jan. 18, 2009.

Botros has attended the Kansas Cosmosphere and Space Center's nationally-recognized Future Astronaut Training Program for the last three summers. With the Future ATP Level 3, she and other students traveled to Johnson Space Center.

The Kansas Space Grant Authority executive meeting was held Sept. 25th with representation by all but one member. October 30 will be the Kansas NASA EPSCoR program meeting at WSU with project reports.

Attending the National Space Grant Director's meeting Oct. 26-28 in Atlanta, Ga., will be KSGC director Scott Miller, associate director Linda Cory and associate EPSCoR director Eddie Irani.

Published through the Ad Astra Initiative of

Space Age Publishing Company, 480 California Avenue, Palo Alto, CA 94306 to promote and publicize Kansas high tech / space tech research and development.

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SMARTT cont.

ence, and Technology Teachers" and "Retaining the Best and the Brightest: Holding on to Top Math/Science/Technology Teachers".

* Cathy Seeley, former president of the National Council of Teachers of Mathematics.

* Liping Ma, author of Knowing and Teaching Elementary Mathematics.

* Lee Stiff, former president of the National Council of Teachers of Mathematics.

Teachers PK-16, parents, school administrators, and school board members are invited to attend. As its name implies, SMARTT 2008 is all about Science & Mathematics -Assessment, Research, and Technology Together.

The Kauffman Foundation has joined us in this endeavor which will be at the Overland Park Convention Center November 6-8. Visit www.kats.org or www.katm.org or email Kay Neill, neillks@cableone.net or Connie Schrock, cschrock@emporia.edu.

The following is part of an ongoing reference directory featuring representative research projects in Kansas. Ad Astra Kansas' goal is to serve as an information hub in Kansas focusing on different areas of high-tech and space research for networking and educational purposes.

ASTRONOMY / PHYSICS

"Mechanisms by Which Cosmic Rays Affect Biodiversity," Alexander Krecji, senior in geology/physics. KU Undergraduate Research Award, Spring 2008

"Optimization of Statistical Analysis Programs for Cosmological Studies," Bradley Klee, senior in engineering physics. KU Undergraduate Research Award, Spring 2008 bradklee@ku.edu

"Analysis and Classification of Background Sources in the Radio Ice Cherenkov Experiment (RICE) Mark Stockham, senior in physics/astronomy. KU Undergraduate Research Award, Fall 2008 hammer@ku.edu

"REU site: Laser-Matter Interaction on Atomic and Nanoscales," \$50,000, Kristan Corwin and Oliver Weaver, KSU Dept. of Physics. NSF funding 5-08. corwin@ksu.edu 785-532-1663

"International Collaboration in Chemistry: Control of Ultrafast EUV-Induced Chemical Reactions," \$397,901 Itzhak Ben-Itzhak, KSU Dept. of Physics. NSF funding 7-08. itzik@ksu.edu 785-532-1636

Robots cont.

tion of the tasks. The KU team finished both tasks, receiving first place awards.

The team competed in two categories of the Sandbox Challenge (Planetary Exploration Challenge) with a simulated planetary surface of gravel and many kinds of rocks.

In the Onto the Surface category robots had to disembark from a simulated lander and travel down ramps into the planet. Though a more complex operation, the KU team had the four robots communicate with each other, thus able to line up and descend in orderly fashion.

The Map Environment category goal was creation of a metric map of the surface in a timely fashion. Each robot was assigned its own section of terrain to map, with the results linked together. Accomplishing the task in only three minutes demonstrated the efficiency of distributed robots. "We demonstrated the utility of a multi-robot team, as one of them had a failure on the ramp and the team was still able to generate a partial map," says Gifford.

Mapping was the hardest part. The challenge was to get these simple, low-cost robots to do the same things more expensive and sensitive sensor systems do.

"Traditional mapping algorithms assume the use of powerful computing equipment and high-accuracy sensors. We had neither and thus had to modify the algorithm (relax their assumption) to allow for the limited computing resources and noisy sensors," says Gifford.

Also a challenge was programming the robots for interaction and cooperation between each other. This communication element is more complex, but also allows for more flexibility, according to Gifford.

AEROSPACE

"Unmanned Aerial Systems (UAS) Phase 2," \$50,000, Richard Barnhart, Salina Applied Aviation Research Center. Awarded by Flint Hills Solutions LLC 8-08. kurtb@ksu.edu 785-826-2972

"Creating Models to Predict Short-Term Drag Effects on Satellites," Andrew Schaeperkoetter, senior in aerospace engineering. KU Undergraduate Research Award, Spring 2008. thrawn77@ku.edu

"NASA Partnership Development In The Area Of Adhesive-Bonded Composite Joints," Charles Yang, WSU Dept. of Aerospace Engineering. NASA EPSCoR funding. charles.yang@wichita.edu 316-978-6312

INFORMATION TECHNOLOGY

"Intra Pulse Radar-Embedded Communications" Shannon Blunt, KU Dept of Electrical Engineering / Computer Science. Project award 4-08 by USAF. sdblunt@ku.edu 785-864-7392

"Improving GEOSat Follow-on Orbits to Improve Density Modeling," Craig McLaughlin, KU Dept. of Aerospace Engineering. NASA EPSCoR funding. craigm@ku.edu 785-864-2974

"Topographic Models with Multispectral Image Registration from Orbiter Data," Dale Schinstock, KSU Dept. of Mechanical and Nuclear Engineering. NASA EPSCoR funding. dales@mne.ksu.edu

"Wide-Band Integrated Si-Based Single Chip TR Module for UHF Radar," William Kuhn, KSU Dept. Electrical and Computer Engineering. NASA funding awarded 8-08. wkuhn@ksu.edu 785-532-4649

Koons cont.

secured by a gunner's belt and tagline attached to the port side. One difficulty for the pilot is disorientation as the rotor wash from helicopter froths the sea and the ocean waves and swells. The copter had only a rudimentary autopilot to control the yaw, and the pilot is working blind so directions from the co-pilot help him keep the copter stable as they hook and lift the capsule.

"We literally chased the spacecraft up and down on the waves," says Koons.

One helicopter retrieved both Shepard and Mercury capsule, not two as is often thought. "That's a misconception that I've spent the last 50 years setting straight because of one drunken reporter," says Koons.

"We hooked up the spacecraft, raised it up out of the water enough that the hatch was clear. Then we sent the horse collar apparatus down to Shepard and hoisted him up, then lifted the capsule and carried it to the carrier," says Koons.

Back on the carrier as Koons was parking the helicopter, before Shepard got off "he stuck his head up through the access to the cockpit, tapped

ENERGY

"III-Nitrides for Hydrogen Fuel Cell and Thermopower Technologies," \$100,000, Hongxing Jiang and Jingyu Lin, KSU Dept of Physics. Funding by U.S. D.O.D. in 2-08. jiang@ksu.edu jylin@ksu.edu

MANUFACTURING and ADVANCED MATERIALS

"Air Purification: Nanostructured Media for Individual Protection," \$99,257, Krista Walton, KSU Dept. of Chemical Engineering. Funding awarded by U.S. D.O.D. in 6-08. k Walton@ksu.edu 785-532-4316

"Application of Digital Element Approach In Textile Mechanics, \$507,187. Youqi Wang, KSU Dept of Mechanical / Nuclear Engineering. U.S. D.O.D. funding 8-08. youqi@ksu.edu 785-532-7181

"Collaborative Research: Mathematical Modeling and Experimental Study of Femtosecond Laser Machining of High Aspect Ration Microstructures," \$30,000. Zenghu Chang, KSU Dept. of Physics and Lei Shuting, KSU Industrial and Manufacturing Systems Engineering. Funding 8-08 by NSF. zchang@ksu.edu 785-532-1621

"Multifunctional Fiber Reinforced Polymer Nanocomposites for Aerospace Structures," Bob Minaie, WSU Dept. of Mechanical Engineering. NASA EPSCoR Seed/Research Initiation (SRI) funding. 316-978-5613 bob.minaie@wichita.edu

Sources: KSU Research and Sponsored Programs Awards, KU Undergraduate Research Awards Spring / Fall 2008, ITTC Project listing, KSGC EPSCoR Program awards

me on the arm and said, 'Good boy.'" Koons recalls.

After the Marines, Koons went on to work for the Space Task Group, then to NASA until 1983 as Chief, Recovery Systems Branch, Landing and Recovery Division, Flight Operations. He also worked in the Space Shuttle Program and Space Shuttle Orbiter Project Offices. Koons worked with all the original seven astronauts.

Koons says his career at NASA was very rewarding. "Every couple of years I was moved from one project to another, always more challenging, always more interesting."

He retired in 1983 and came home to Lyons to take over the family farm because from both a family and professional view the timing was right.

Those years working for NASA "were personally gratifying, it gives me a sense of accomplishment. I was glad to be of service to my country," says Koons.

Wayne Koon's oral history may be read at http://www11.jsc.nasa.gov/history/oral_histories/k-l.htm

Interstellar R&D

Ad Astra Kansas News

This "Interstellar R&D" fourteenth-time feature in this *Ad Astra Kansas News* fourteenth issue continues an enterprise to research and gather information on the most important developments preparatory to humanity's greatest adventure — voyaging to the stars. Now, at millennium's turn, is an appropriate time for grand vision and forward thinking, and there are strong signs of a renaissance in interstellar travel thought and activity. This new feature and newsletter, thus, now set forth to develop a national / international / global clearing center and storehouse of knowledge and know-how for travel to the stars: *Ad Astra*. — Steve Durst, Michelle Gonella

OBSERVATION

Galaxy Education in the 21st Century

Galaxy Forum USA 2009 is planned for July 4 at the New Venture Hall, Tech Museum of Innovation, San Jose, California, and follows the exploratory, proof-of-concept, first such forum July 4, 2008, in Santa Clara, Calif. Sponsored again by the International Lunar Observatory Association of Hawai'i and Space Age Publishing Company, Galaxy Forums in 2009 also may develop for Canada, China and elsewhere, similarly building on the successes of 2008 exploratory meetings.

The theme 'Galaxy Education in the 21st Century' suggests development and introduction of a teaching / learning Unit on Galaxy Education throughout the USA education system — primary and secondary, public and private, university and advanced — and throughout the education system of any nation.

Leading space education organizations such as the Federation of Galaxy Explorers, the Challenger Center, the International Space University, and the UCLA Galactic Center Group; and galaxy education projects such as the "Galaxy Garden" in Hawaii and the new and expansive "Galaxy Zoo" are making Galaxy awareness and consciousness, knowledge and learning, inspiration and direction a transcending reality for the coming New Decade.

'Galacticity', or 'galactivity' — awareness of the galaxy infrastructure of the universe and humanity's place in it — may be as influential and formative a force for the 21st century (and for Ad Astra Kansas interests) as is 'Relativity' for the 20th.

COMMUNICATION

Cepheids Pulse: Binary Code Of A Galactic Internet?

Cepheids are rare, variable stars that dim and brighten in a regular pattern, related to how bright they are. They have been observed in galaxies over 100 million kilometers from the Milky Way.

This natural phenomenon caught the attention of University of Hawaii researcher John Learned. The blinking Cepheids' beacon-like quality could be observed for very long distances...even in interstellar terms. If it were possible to manipulate the timing of the pulses, might the stars be used to send out data in binary code by some advanced civilization?

The blinking of Cepheids is caused by the atmosphere expanding and deionizing. This results from buildup of ionized helium, which causes the star to dim. Learned points out that a high energy neutrino beam, aimed at the star's core, would artificially cause the Cepheid to brighten and enable binary data transmission.

SETI senior astronomer Seth Shostak has reservations, comparing the theory to the Russia concept of using the 100-200 supergiant stars to create anomalous radiation signals. Based on the estimate that Cepheid transmissions would use a millionth of a Cepheid's energy, Shostak points out that a high-powered radio beacon could transmit more data over the same distance.

Learned agrees that the chances of identifying a message are very slim. A Cepheid with a one day cycle would only be able to transmit around 180 bits each year.

Princeton physicist Freeman Dyson calls the

theory "an interesting idea that can be tested." With 100 years of data already available, it is worth taking a look. "Analyzing that data would take a graduate student a couple of months...the implications would be astounding," notes Learned.

TRANSPORTATION

Nanotechnology and Interstellar Propulsion

Imagine zero friction nanomachines whose parts levitate. In the amazingly tiny world of nanotechnology, this possibility is being examined. It could result from control of the Casimir effect, the ultimate cause of friction at the nano scale. The Casimir effect was identified by Hendrik Casimir of the Netherlands. Casimir suggested that placing two parallel mirrors within a vacuum, and then moving them closer together, would result in a greater concentration of electromagnetic waves around the mirrors than between them, causing a tiny attractive force.

This "Casimir cavity"—the space between the mirrors—would be considered an area of "negative energy density," since the surrounding vacuum is defined as an area of zero energy and the cavity excludes some electromagnetic waves.

Negative energy density was conjectured as the key to Star Trek's "warp drive" by Mexican theoretical physicist Miguel Alcubierre. He envisions a scenario where a traveling spacecraft would expand space/time in its wake and contract the space/time in its path. Yet technically, the spacecraft would be "at rest."

Most important is that the Casimir effect shows that a vacuum can be used as an energy reservoir. A propulsion system which can make use of that energy is still a long way off, however.