Volume 3, Issue 05

May, 2003

ROCKETEERS OF CENTRAL INDIANA

ROCI News

Scaled Composites' Secret Space Program

By Mario Perdue—from press releases

Mojave, California, April 18, 2003:
On April 18, 2003, Scaled Composites unveiled the existence of a commercial manned space program. This previously hidden, active research program has been in the works at its facility for two years. The program is comprised of seven systems, an airborne launcher (the White Knight), a space ship (SpaceShipOne), rocket propulsion, avionics, simulator and ground support elements.
Master of Ceremonies, Cliff Robertson, introduced Burt Rutan who explained the history and the components of the program. Other dignitaries who attended the event were Dr. Maxim Faget (pioneer configuration designer of the early NASA space program from the Mercury through the Apollo programs), Erik Lindbergh (grandson of Charles Lindbergh and President of the Lindbergh Foundation), and Dennis Tito (Soyuz space tourist).
According to the company: "Scaled Composites, the most prolific research aircraft development company in the world, is tired of waiting for others to provide affordable human space access. Active and hidden for two years, an aggressive, manned suborbital space program has been in work in the Mojave, CA desert."

They further state, "This is not just the development of another research aircraft, but a complete manned space program with all its support elements."

The concept dates back to April 1996. Design work and some limited testing was started 3.5 years ago. The full development program began in May 2001.

The White Knight

The first flight of the White Knight only lasted 2 minutes due to a problem with the spoilers. The airplane had outboard spoilers on the wings to help improve roll control in the event of gusty cross wind landings. They were pneumatically actuated (using the same tanks, valves and fittings as the RCS system on SpaceShipOne) and returned to recesses in the wings by springs. On the first flight, the low air pressure, at rotation was sufficient to "suck" the spoilers out which killed the lift and caused the return springs to slam them closed. Four of these surfaces chattering out on the wingtips during the climb out produced significant airframe vibrations and the pilot elected to turn downwind and land immediately rather than aggravate the condition any longer than necessary.

One of the many unique features of the two vehicles is the use of several small round windows. Despite the unusual design, the visibility is actually much better than you might imagine. By moving your head slightly you can piece together an acceptable picture of the outside world and maintain adequate "situational awareness". What is more difficult is spotting other airborne traffic. However, between radar advisories from ground controllers and an onboard traffic alert system called "Sky watch," this limitation is minimized.

Because of the high altitudes involved the aircraft body was designed as a pressure envelope. This means that there is no exchange of air with the outside during flight.

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Inside this issue:

Scaled Composites' Secret Space Program

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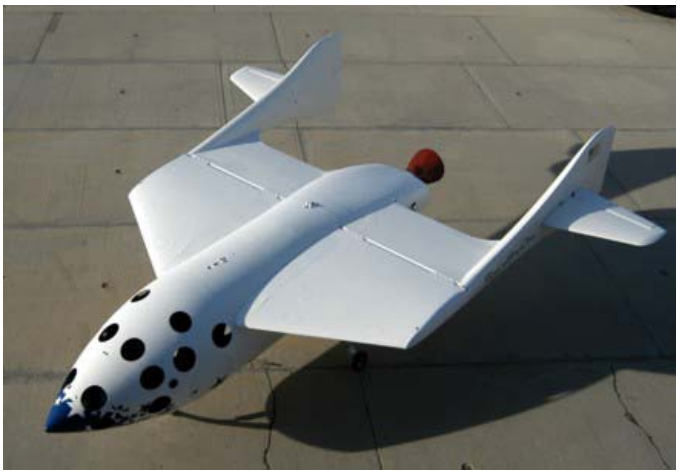
There are three components for keeping the cockpit environment suitable in flight. One, oxygen is added at a small rate for that used by breathing. This is done with a small bottle carried in the cabin. Two, the carbon dioxide from the exhaled air needs to be removed and this is done by means of a substance called "Sodasorb". Finally, the humidity is controlled by another substance called "3X" that removes water vapor, and helps keep the cabin cool and dry.

Right from the start the White Knight has been one of Scaled Composites' best handling aircraft. It has good control harmony and is surprisingly responsive for a large airplane. Despite its high wing, the airplane's dihedral effect (being able to pick up a wing with rudder only control) was too low. Therefore, winglets were added.



SpaceShipOne

SpaceShipOne is the component that will actually carry the new astronauts into space. The craft will be released by the White Knight and will attempt the reach an altitude of 100 Kilometers (62 miles) before returning to earth. The wings are folded up to provide a shuttle-cock or "feather" effect to help stabilize the vehicle for reentry. This configuration orients the vehicle to a belly first attitude that increases its drag and reduces its speed while coming back into the atmosphere thus helping to lessen the aerodynamic heating and reduce G-buildup.

Pilots and passengers will not have to wear the bulky pressure suits that we are all used to seeing on space flights. The design of the cockpit with its dual seals and window panes is essentially a space worthy cockpit surrounded by a second outer space worthy shell. This redundancy eliminates the need for a space suit and allows the crew to operate and test the vehicle in comfort. Scaled Composites' Proteus vehicle has a similar cockpit design and has over 1,000 flight hours in a "shirt sleeve" environment.

Scaled Composites' pilots come from a variety of different backgrounds and experiences. It is the training provided by in-house assets and program specific resources that provide confidence in our ability to fly the space ship. This training includes glide approaches in our twin engine Duchess, acrobatic and unusual attitude training in an Extra 300, a sophisticated simulator with tailored flight displays for each distinct phase of flight and finally the in-flight exposure to the same cockpit environment provided by the White Knight aircraft.

Rocket controls are very simple. Two switches, one to Arm it and a second to Fire it. The avionics suite has a dedicated propulsion display that shows various critical motor parameters that can be monitored both by the pilot before launch and by a ground station during flight. There is no provision for the pilot to modulate the rocket thrust.

The Rocket Motor

SpaceShipOne is powered by a Hybrid motor. While hybrid motors are not new, the configuration utilized by SpaceShipOne is unique with its fuel case and nozzle cantilevered off the main oxidizer tank, which in turn, forms part of the vehicle's aft fuselage. Its largest components, the oxidizer tank and fuel casing, are a Scaled Composites' designed composite structure. The rocket hardware - fuel injectors, valves, controls, ignition systems and fuel characteristics - is being competed between two independent rocket companies. What's the deal with laughing gas and rubber?

All rocket motors have some form of "fuel" and an "oxidizer". In solid rocket motors the oxidizer is embedded into the fuel (like an Estes rocket motor) and when lighted will burn until depleted. In liquid rockets the oxi-

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Scaled Composites' Secret Space Program

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dizer is usually liquid oxygen and the fuel another liquid like hydrogen or kerosene. In the Scaled Composites hybrid motor they use Nitrous Oxide (NO2 or laughing gas) as an oxidizer and hydroxy-terminated polybutadiene (HTPB or rubber) as the fuel. Both of these can be safely stored without special precautions and will not react when put together. Finally NO2 has the nice quality of self-pressurizing when at room temperature so that the space ship doesn't need complicated turbo pumps or plumbing to move the oxidizer into the combustion chamber.

To start a hybrid motor first requires introducing a significant source of heat into the fuel and then introducing the oxidizer. A hybrid motor does not start by accident and thus it is a safe and simple alternative to its liquid and solid cousins. The products of combustion are mostly benign (water vapor, carbon dioxide, hydrogen and nitrogen and some carbon monoxide) and certainly much more friendly than any other class of rocket propulsion.

The motor is partly reusable. The oxidizer tank is reusable and the same fuel casing can support several short firings or one long one. The intent is to replace the fuel casing and nozzle between high altitude flights.

The X-Prize

The goal of SpaceShipOne is to get to 100 kilometers or about 62 miles up. This altitude was established by the X-Prize foundation as a target to stimulate commercial interest in the technology to achieve it. $10M will be awarded to the first team to make it before the end of 2004.

ROCI Information

ROCI meets at **HobbyTown USA** in Castleton, Indiana at 6:30pm, on the third Tuesday of each month. Non-members are welcome to attend. Most meetings last approximately one (1) hour and conclude with an educational presentation.

ROCI is Section #625 of the National Association of Rocketry (NAR). Membership in the NAR is encouraged, but not required, for ROCI membership. You may become a member of ROCI at any scheduled meeting or launch.

All paid ROCI members receive a discount on any rocketry kits, motors and supplies purchased on meeting nights.

For additional information call 845-4106.

Meeting Schedule:

- Tuesday, May 20, 6:30 PM
- Tuesday, June 17, 6:30 PM
- Tuesday, July 15, 6:30 PM
- Tuesday, August 19, 6:30 PM
- Tuesday, September 16, 6:30 PM
- Tuesday, October 21, 6:30 PM
- Tuesday, November 18, 6:30 PM
- Tuesday, December 16, 6:30 PM

AREA Launches

ROCI 2003 Sport Launch Schedule

- Friday, Jun 6 to Sunday, Jun 8 - 10:00 AM to 5:00 PM
- Saturday, Aug 9 - Noon to 5:00 PM
- Saturday, Oct 9 - Noon to 5:00 PM
- Saturday, Novr 9 - Noon to 5:00 PM

ROCI 2003 HPR Launch Schedule

- Saturday, May 24 to Sunday May 25 - 10:00 AM to 5:00 PM
- Saturday, Sep 9 to Sunday, Sep 9- 10:00 AM to 5:00 PM

Unless otherwise noted, all ROCI Sport and HPR Launches are held at the Academy of Model Aeronautics, 5161 East Memorial Drive, Muncie.

AMOREA 2003 Sport Launch Schedule

- Sunday, April 27 - 1:00 PM to 5:00 PM
- Sunday, May 18 - 1:00 PM to 5:00 PM
- Sunday, July 20 - 1:00 PM to 5:00 PM
- Sunday, August 17 - 1:00 PM to 5:00 PM
- Sunday, September 21 - 1:00 PM to 5:00 PM
- Sunday, October 27 - 1:00 PM to 5:00 PM
- Sunday, November 19 - 1:00 PM to 5:00 PM

Unless otherwise noted, all AMOREA sport launches are held in the Lawrence Park at Ft. Benjamin Harrison, west of the US Army Finance Center.

Meeting Minutes - 04/15/03

By T. Gary Degler

Member Attendees	
Mario Perdue	Greg May
Gary Degler	Lisa Degler
Rick Weber	Bob Jackson
Terry Bush	Monty Chaffin
Carl Simmons	

Proceedings

1. Minutes of previous meeting approved as read.
2. $584.64 in the treasury.
3. Make & Take – April 12th at HobbyTown, sponsored by Estes and HobbyTown. Mario and Gary handled the presentation and build sessions, and handed out ROCI info cards and launch schedule cards. We have contact info on 14 kids, who were given membership cards and received a year's free membership in the club.
4. We talked about a receiver for the AMA's 'weather info center' transmitter, and Mario said that Steve Kaluf has one we can use but we might have to modify the antenna for better range.
5. We briefly discussed upcoming launches to get equipment and staffing details squared away.
6. 40th Anniversary Alphas: Mario has the two Alphas, that are to be flown in all 50 states, and then displayed in the Smithsonian and at the Estes Museum. One is signed by Vern Estes and his wife, and Harry Stine's son. People involved are invited to submit club items or photos to go along with the exhibit, and we took some photos of the Alpha rockets with a Hooter's gal.
7. Monty presented a HPR rules and guidelines booklet and floppy disk files for the AMA launches, adapted from our proposal. We discussed some changes and additions, including some checklists and more details. We also talked about a 'disclaimer/release-form' due to new regulations.
8. Mario said we should still be sending letters and faxing our state senators concerning the Senator Enzi BATF issue proposal.
9. Shirt and cap embroidery order: we looked at a catalog for some options and ideas.
10. Mario received a timer as a gift from the Covenant Christian TARC team for his help on their qualification flights.
11. Rick Weber showed some 'various density' foam, some igniter materials and procedures, and some rocket plans from the Covenant group for the TARC finals.
12. Rick Weber door prize drawing for those at the meeting 17 years old and under: Lisa Degler won by default, and got a nice Quest rocket kit and 3 C6-5 motors.
13. Next Meeting: Tuesday, May 20th at HobbyTown.

Carmel Library Hosts Rocketry Workshop

By T. Gary Degler

ROCI was represented at two great Make & Take sessions at the Carmel Library on March 8th, hosted by Dave Newill, the founder of the AMOREA NAR Section. Dave has, for many years, been involved with rocketry, education, scouting groups, and has conducted numerous Make & Take sessions. He did a great job of explaining model rocketry physics and safety, and also in leading the rocket build sessions; we had around 50 kids and parents between the two 1 1/2 hour sessions. Everyone seemed to have a great time building their free Estes Alpha III kits and seemed to be very interested in model rocketry.

Gary Degler from ROCI was on hand to help the kids with building their Alpha kits. He also brought several rockets to show to the kids, ranging from a tiny Quark to a 3 1/2' tall AQM-37c. We showed the ROCI promotional video to both groups, had a couple ROCI posters displayed with this year's schedules, and had some ROCI handouts including 2003 schedule cards, HobbyTown/ROCI info cards, and NASA 'Space Place' URL cards to distribute.

Sharon from the Carmel/Clay Library was our very gracious hostess and 'MC', who also helped with handing out kits and tools, setting up and cleaning up, and she could acquire tables and easels at a moment's notice. The facility was outstanding, in fact the Library was almost like a mall with a Coffee Shop/Snack Bar and a Gift Shop in the front hallway. We had two adjacent rooms; one was classroom style with tables for the build session, and the other was a nice media room where we showed the video and displayed several model rockets and conducted rocketry education sessions. The media room had a front-projection video projector and a 9' screen, and had a very impressive AV rack and sound system.

Several of the participants stayed around afterwards asking questions, and I hope we will see some of these people at the HobbyTown Make & Take, AMA launches, and/or some of our meetings. Thanks to Dave for arranging to host a very successful rocketry event.

ROCKETEERS OF CENTRAL INDIANA
ROCI

The President's Corner

By Bill Lape

As I write this, we have just concluded our first launch of the season at the AMA. Several of our flyers showed up to some breezy conditions that were offset by the blue sky and sunshine. My son launched his first model rocket at this launch (a Quest Starhawk on an A6-4) and my daughter launched her slightly modified Quest Viper four times trying to win the unofficial (hence the multiple flights) Open Spot Landing event. I, myself, did not launch any rockets, but I did have a good time talking with the Tripoli prefect for SCAM (I apologize for not giving his name. As I write this, I can't for the life of me remember it other than that his first name was Mark.) ***Editors Note: The person in question is Mark Rogers.***

This past launch served to remind me that our hobby is tremendously rewarding in many ways. Most of my friends are involved in the hobby. I have an activity that I can share with my children. It also encourages them educationally.

We may occasionally have disagreements over club policies or actions, but I hope that each member does his or her best to remember that our activity is a HOBBY that is to be enjoyed. To this end, civil, open lines of communication must be maintained between all members. Sometimes we must agree to disagree and allow the majority to set our path. There is no room for petty politics and hurt feelings within the club. If we are going to involve ourselves with politics, then we must focus our energies on those forces in Washington that are trying to regulate a large portion of our hobby out of existence under the guise of Homeland Security. Please remember to write your Senators in support of Senate Bill S.724. I, for one, do not wish to lose the rewards of this hobby.

April Launch Report

By Monte Chaffin

The first ROCI launchof 2003 was held on April 19th at the AMA field in Muncie. Although it was rather windy, the rain gods decided to be nice to us. Mario Perdue had the first two launches of the day with the 40th aniversary Alpha's. These are the same two Alpha's that are on display as the photo of the week at the IndyRockets web site located at http://www.indyrockets.org/. I'll let Mario tell you about the Alpha's & the photo!!!

Next was my old Centuri Lil Ivan which we used to set the open spot landing mark. This was our fist launch contest and Jim Stum showed us how to use those 1/2A's in an Alpha to win. Alicia Lape and Jim's wife Dianna were just no match for the old pro. Congrats to Jim for the win.

Terry Bush treated us with launch of his PML Quasar with one of the new Pro38 G67 reloads. I think it is safe to say that they are an instant on motor!!! No waiting on those puppies to ignite.

And the last launch of the day was a chad staged The DUDE rocket from Estes flown by John Eiteljorge. We all had a good laugh at that one.

Launch report specs, most launches...

Terry Bush - 7
Randy Powell - 7
John Eiteljorge - 5
Dianna Stum - 5
Alicia Lape - 4
Mario Perdue - 4
Jim Stum - 4

We had 49 flights using a total of 54 motors. Motor break down...

A	B	C	D	F	G
20	8	8	10	4	4

A good time was had by all that attended. Our next launch will be the ROCI HPR Launch at the AMA field on May 24th & 25th. Hope to see you there...

ROCI
Rocketeers of Central Indiana

The HobbyTown Make-n-Take

By T. Gary Degler

On April 12th ROCI hosted a 'Make & Take' rocket building session at HobbyTown USA, sponsored by Estes and HobbyTown. Mario Perdue and Gary Degler handled the four, hour-long presentations and build sessions. Fourteen kids, aged from around 6 to 13 years old, learned how to build their Estes E2X Generic rocket kits that were provided to them free of charge. They were also schooled on the basic science and safety rules of model rocketry. Each group viewed the ROCI video when they were finished building their kits and they enjoyed watching the launches. Every child who participated was given a one year free membership in the club, and were also provided ROCI info cards and launch schedule cards. Combined with the new 'door prize' drawings on meeting nights for kids 17 and under, we are getting a good start to our efforts to get more 'young people' involved with our club.

Laughing Gas and Candle Wax

By Rick Weber

Weber/Galejs Hybrid Rocket Motor

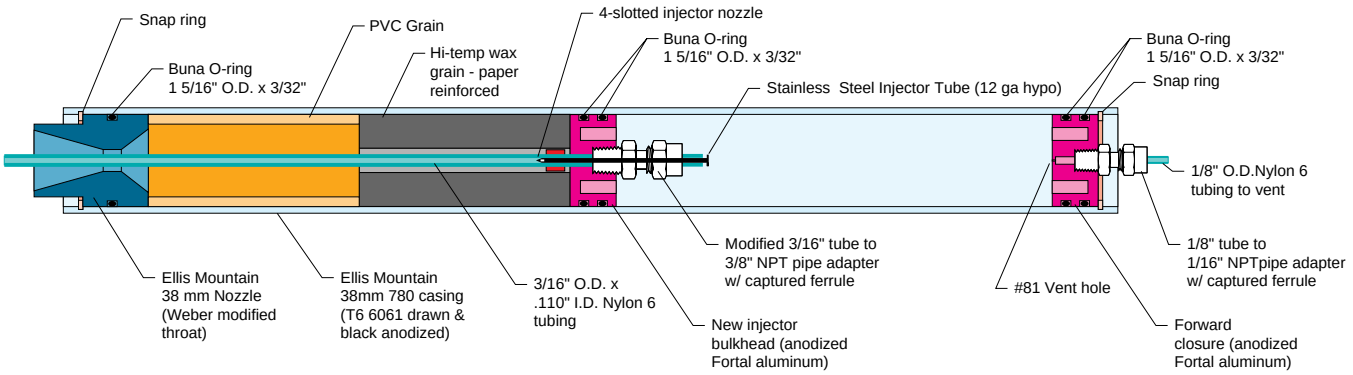

Figure 1 is a cutaway drawing of our wax/PVC/N2O hybrid design. Note how the injector body is fitted with the nylon tube connector INSIDE the N_2O tank. The PVC also burns as a fuel and provides a post combustion chamber in which unburned wax droplets can be further combusted. Also shown is the injector design adapted from Dave Griffith's design. A starter/preheater grain is fitted onto the 3/16" nylon tube in the combustion

Unless the BATF discovers that it left a stone unturned, allowing us to fly hybrid motors sans LEUP, and adds N2O to its list of "no-no's", the mid and high power rocketry community will undoubtedly see a surge in interest in this kind of motor. Several companies are now developing small hybrid motors for NAR certification. As this information becomes available, we will make it available in this newsletter.

There has been a great deal of interest in wax burning hybrid rocket motors in recent months. Volume 3, Issue 1 of the ROCI Newsletter reported on wax hybrid motor development by NASA Ames. A number of amateurs are also working on wax hybrid designs. Because wax is a kind and gentle fuel that is also environmentally friendly, it wouldn't surprise me to see certified motors in the near future using it.

The advantage of using paraffin wax in hybrid motors is that it provides relatively high specific impulse and high regression rates from a nonvolatile, environmentally friendly fuel, which is for the most part, candle wax. And, unlike solid fuel burners, this type of rocket can be stopped and restarted on command.

The challenge has been to figure out how to burn wax predictably. Accompanying the fast (and very desirable)

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Laughing Gas and Candle Wax

regression rate is the tendency for a wax grain to burn un-uniformly. Globs of wax can form that deteriorate the motor's performance. And, a rocket's acceleration can significantly deform a wax grain.

wheel.

Early this year, a respected amateur rocket experimenter, Robert Galejs, and I combined our resources to develop a wax hybrid motor that incorporates features

Figure 2 is a photo of the actual components of the hybrid test motor. The parts are anodized to provide a burn-resistant surface.

I've been working on a wax grain design that allows the wax to regress more uniformly, at the same time maintaining structural integrity of the grain. For the most part, it is hoped that this can be accomplished by impregnating a wax grain with layers of paper, which ablate uniformly and predictably during the combustion process. The paper provides a thermal barrier to the wax lying behind it for a brief time until it is burned away. The process progresses through the entire grain. Currently, the most promising grain is made of crepe paper wrapped around a mandrel, then soaked in hot hurricane wax. This makes a cylindrical grain with about 96% wax by mass. The paper acts as an ablating thermal barrier, thereby keeping the wax from melting too fast into globs.

The paper not only provides a barrier, but actually adds a fair amount of energy. Many hybrid experimenters, including myself, have successfully used grains made only of paper.

Another method for controlling how a wax grain burns is to provide a specially designed injector orifice that disperses nitrous oxide into the grain in a pattern that diminishes uneven regression. My design closely follows one recently developed by Dave Griffith of RattWorks fame. It starts with standard 12 gauge stainless steel hypodermic tubing and includes a nozzle shaped with a diamond

that we have developed independently. We designed, and I constructed a 38 mm motor in which various grain materials and configurations will be tested airborne soon.

At a ROCI meeting a couple months ago, some of you saw the load cell test stand that I developed for this mo-

Figure 3 is a photo of the injector assembly with the injector bulkhead.

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Laughing Gas and Candle Wax

tor. It will be capable of acquiring measurements of thrust/time, temperature/time, and chamber pressure/time at a rate of 240 samples per second, with a thrust measurement accuracy of 1%. The results of our test of this motor will be posted on a website linked to the ROCI page.

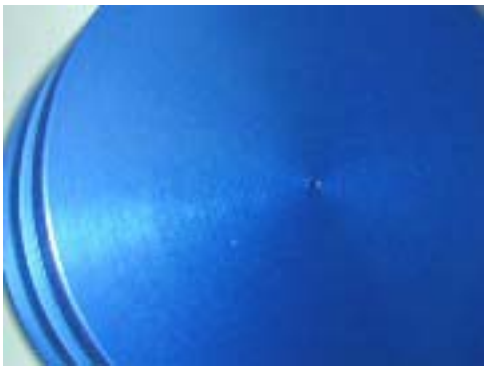


Figure 4 is a photo of the vent hole in the forward bulkhead. It is .009" diameter and vents through a 1/8" diameter nylon tube to a port on the rocket body tube.

Figure 5 is a photo of our motor sitting in a test stand. The load cell stand will be mounted to a concrete and wood base that is under construction on a secluded 20-acre plot south of Indianapolis. Although the test stand will accommodate motors up to 2,200 pounds thrust, our wax hybrid falls into the "J" class.

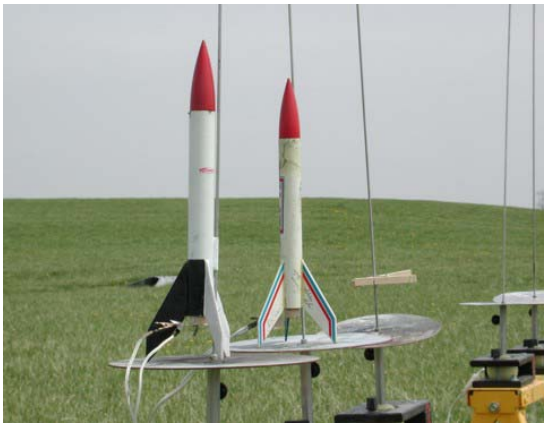
The 40th Anniversary Alphas Fly in Indiana

By Mario Perdue

I received the Alphas during the first week of April. My plan was to get them flown and sent on the next flyer in a few days; the weather, especially the wind, had other ideas. When our monthly meeting came around on the 12th of April, I still had the rockets, so I took them to the meeting to show around a bit. After the meeting, a few of us went to the local Hooters restaurant. The Alphas were tired of laying in their box, so they went with us. Kami, our waitress, agreed to pose for a photo with the Alphas. The photo turned out great and should be a welcome addition to all the photos of the rockets sitting on, or just leaving, the launch pad. A good time was had by all.

Above—Kami, our waitress, poses with the alphas.

Below—The 'standard' shot of the Alphas on the pad ready to launch.



On April the 19th the Alphas were launched at the Academy of Model Aeronautics' International Aeromodeling Center in Muncie, Indiana. They were the first two flights of the Rocketeers of Central Indiana's first launch of the year. Both rockets were flown on A motors and were recovered without damage (at least no more damage than they had before they were launched.)

It was fun to be involved with this project. Hopefully, the remaining flyers will make an effort to get the rockets flown and shipped to the next person on the list faster than some have done in the past.

In Search of Alien Oceans

by Patrick L. Barry and Dr. Tony Phillips

A robotic submarine plunges into the dark ocean of a distant world, beaming back humanity's first views from an alien ocean. The craft's floodlights pierce the silty water, searching for the first, historic sign of extraterrestrial life.

Such a scenario may not be as fantastic as it sounds. Many scientists believe that Jupiter's moon Europa conceals a vast ocean under its icy crust. If so, heat from the moon's interior-which would keep the ocean from freezing solid-may also drive subaquatic volcanoes and hydrothermal vents. On Earth, such deep-sea vents provide chemical energy for ecosystems that thrive without sunlight, and some scientists even suggest that Earthly life first got started around these vents.

So a warm Europan ocean spotted with thermal vents could be a natural incubator for life. That's why some scientists hope that someday we will send a probe to Europa that could bore through the ice and explore the ocean below like a submarine.

To plan for such a mission, scientists would first need to put a camera in orbit around Europa. By looking for places where water has welled up to fill the spindly cracks that riddle Europa's surface, scientists can estimate where the ice is thinnest-and thus easiest to bore through.

That mission scenario presents a problem, though. Europa orbits Jupiter inside the giant planet's punishing radiation belts. Continuous exposure to such high radiation would damage today's scientific cameras, making the information they gather less reliable and perhaps ruining them completely.

That's why NASA is designing a more radiation-tolerant CCD that could be used on a mapping mission to Europa. A CCD (short for "charge-coupled device") is a digital camera's chip-like core, which converts light into electric signals.

"We've seen the effects of this radiation during the Galileo mission to Jupiter," says JPL's Andy Collins, principal investigator for the Planetary Imager Project. "Galileo has orbited Jupiter for many years, dipping inside the radiation belts only for brief intervals. Even so," he says, "we've seen clear signs of damage to its instruments."

By using the hardier CCD's developed by the Planetary Imager Project, a future probe could remain in Jupiter's radiation belts for many months, gathering the maps scientists will need to finally get a peek behind Europa's icy veil. And who knows, maybe there will be something peeking back!

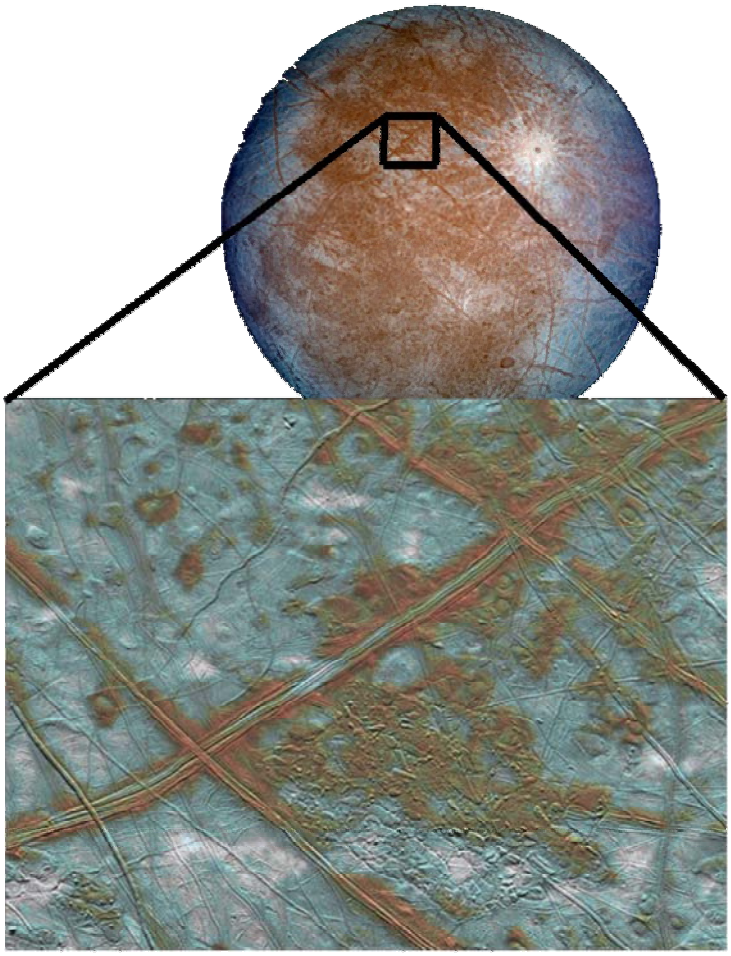
To learn more about the Galileo mission to the Jupiter system, visit http://www.jpl.nasa.gov/galileo/ .

NASA's Space Place

For children, a fun, interactive "Pixel This!" game at http://spaceplace.nasa.gov/p_imager/pixel_this.htm introduces CCDs and how a really tough one will be needed for a future mission to Europa.

This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

http://spaceplace.jpl.nasa.gov



Cracks on the icy surface of Jupiter's moon Europa give evidence of a liquid ocean below.

Meet an Astronaut: Mark E. Kelly - Commander, USN

NASA Biography

PERSONAL DATA:

Born February 21, 1964 in Orange, New Jersey, but considers West Orange, New Jersey, to be his hometown. Married to the former Amelia Victoria Babis of Roscommon, Michigan. They have two children. He enjoys running, weightlifting, basketball, golf. His parents, Richard and Patricia Kelly, reside in Flagler Beach, Florida.

EDUCATION:

Graduated from Mountain High School, West Orange, New Jersey, in 1982; received a bachelor of science degree in marine engineering and nautical science (with highest honors) from the U.S. Merchant Marine Academy in 1986, and a master of science degree in aeronautical engineering from the U.S. Naval Postgraduate School in 1994.

ORGANIZATIONS:

U.S. Merchant Marine Academy Alumni Association.

AWARDS:

Awarded four Air Medals (2 individual/2 strike flight) with Combat “V,” Navy Commendation Medal with “V,” Navy Achievement Medal, two Southwest Asia Service Medals, Navy Expeditionary Medal, two Sea Service Deployment Ribbons, Overseas Service Ribbon, and various other unit awards.

EXPERIENCE:

Kelly received his commission from the U.S. Merchant Marine Academy in June 1986, and was designated a Naval Aviator in December 1987. He then reported to Attack Squadron 128 at Naval Air Station (NAS) Whidbey Island, Oak Harbor, Washington, for initial training in the A-6E Aircraft. Upon completion of this training, he was assigned to Attack Squadron 115 based in Atsugi, Japan. While assigned to Attack Squadron 115 he made two deployments to the Persian Gulf aboard the USS Midway. During his second deployment he flew 39 combat missions in Operation Desert Storm. During this tour he was designated an Airwing Qualified Landing Signals Officer (LSO). Kelly was selected for the Naval Post Graduate School/Test Pilot School Cooperative Education Program in July 1991. He completed 15 months of graduate work at Monterey, California, before attending the U.S. Naval Test Pilot School in June 1993. After graduating in June 1994, he worked as a project test pilot at the Carrier Suitability Department of the Strike Aircraft Test Squadron, Naval Air Warfare Center, Patuxent River, Maryland, flying the A-6E, EA-6B and F-18 aircraft. Kelly was assigned to the U.S. Naval Test Pilot School as an instructor pilot in the F-18, T-38 and T-2 aircraft when selected for the astronaut program.

He has logged over 3,500 flight hours in more than 40 different aircraft and has over 375 carrier landings.

NASA EXPERIENCE:

Selected by NASA in April 1996, Kelly reported to the Johnson Space Center in August 1996. Having completed two years of training and evaluation, he is qualified for flight assignment as a pilot. Kelly was initially assigned technical duties in the Astronaut Office Computer Support Branch. He flew on STS-108 in 2001, and has logged almost 12 days in space. Kelly is assigned as pilot on STS-119. STS-119 is the 22nd Space Shuttle mission dedicated to the assembly of the International Space Station. While docked to the station, the crew will install the S6 Truss element and relocate the P6 Truss element to its final location, completing the construction of the electrical generation system and distinctive truss structure of the station. They will also deliver the ninth long-duration crew and supplies to the station and bring home the eighth crew. The mission is slated for launch in early 2004.

SPACE FLIGHT EXPERIENCE:

Kelly served as the pilot for STS-108 Endeavour (December 5-17, 2001). STS-108 was the 12th shuttle flight to visit the International Space Station. Endeavour’s crew delivered the Expedition-4 crew and returned the Expedition-3 crew, unloaded over 3 tons of equipment and supplies from the Raffaello Multi-Purpose Logistics Module, and performed one space walk to wrap thermal blankets around ISS Solar Array Gimbals. STS-108 traveled 4.8 million miles orbiting the earth 185 times in 283 hours and 36 minutes.

Rocketeers of Central Indiana

C/O L4 Software
PO Box 501289
Indianapolis, IN 46250-6289
Phone: 317-335-3775
Email:mperdue@indyrockets.org

To:

Editor: *Mario Perdue*
President: *Bill Lape*
Vice President: *Rick Weber*
Treasurer: *T. Gary Degler*
Safety: *Monty Chaffin*

ROCINews is the official publication of Rocketeers of Central Indiana (ROCI) chartered Section #625 of the National Association of Rocketry (NAR). ROCI serves the Central Indiana hobby rocketry community. ROCINews is distributed electronically via the ROCI web site. Submission of articles for publication should be made to the ROCINews editor, via email, at mperdue@indyrockets.org or, via post, to Mario Perdue c/o L4 Software, PO Box 501289, Indianapolis, Indiana 46250-6289. Mailed submissions will not be returned unless previous arrangements have been made.

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Editor's Soapbox

Some days all you can do is smile and wait for some kind soul to come pull your butt out of the bind you've gotten yourself into.