THE LEADING EDGE

The Newsletter of the Northern Illinois Rocketry Association Jan/Feb 2009

SUPERSIZE NIRACON ISSUE

MODEL OF THE YEAR WINNERS

Congratulations to
Katie Mitchell, Angel Cooper, and Tony Lentini

Danger Zone ***SR-71 Blackbird*** ***Tintin Moon Rocket***

THE LEADING EDGE

Anthony Lentini
Newsletter Editor/Publisher
editor@nira-rocketry.org
630-372-4999

NIRA OFFICERS

Rick Gaff
President

Angel Cooper
Vice President

Nick Lauerman
Secretary/Treasurer

Bob Kaplow
Range Safety Officer

Marty Schrader
NIRA Webmaster

Visit our web site & message board;
http://www.nira-rocketry.org/
http://groups.yahoo.com/group/nirarocketry/

The Leading Edge is published bi-monthly for members of the Northern Illinois Rocketry Association (NIRA) NAR Section#117
Dedicated to the idea that rocketry is fun!

Contributors this issue;

Articles	Tony Lentini
Photographs	Rick Gaff, Tony Lentini

-T Minus One-

Launch Windows

NIRA Club Launches

April 19 East Branch Forest Preserve

Fox Valley Club Launches

April 18 Mid-Power Launch Hughes Seed Farm

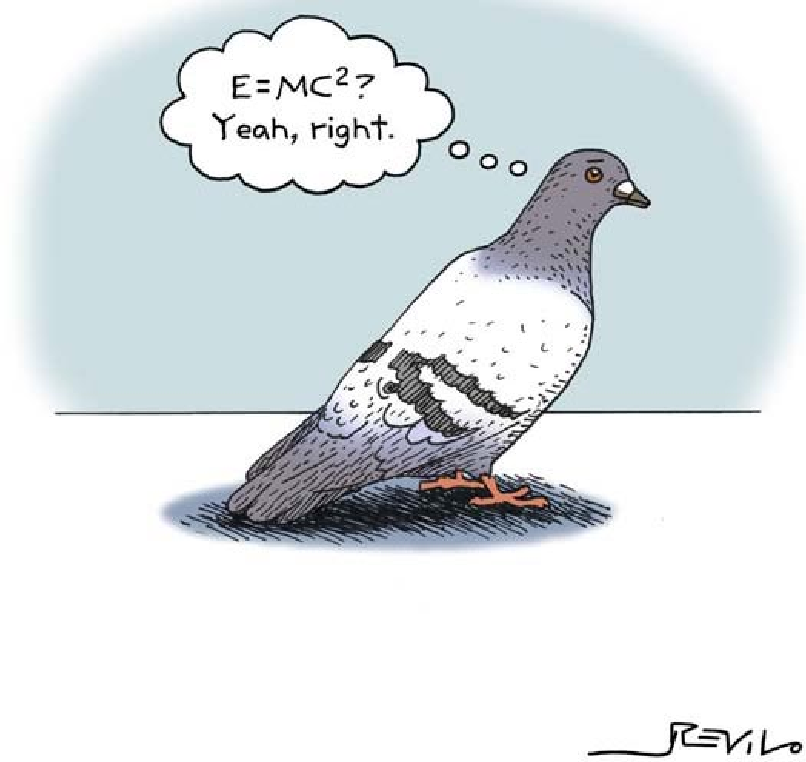
Meeting Calendar

NIRA

Mar 7	Monthly meeting Glen Ellyn library, Lombard 400 Duane St, Glen Ellyn, IL
Mar 15	Building Session at Tony Lentini's house. 1301 Whirlaway Ln, Hanover Park, IL
April 3	Monthly meeting Helen Plum Library, Lombard

Fox Valley Rocketeers

Mar 2	Monthly meeting McHenry Public Library
April 6	Monthly meeting Woodstock Public Library

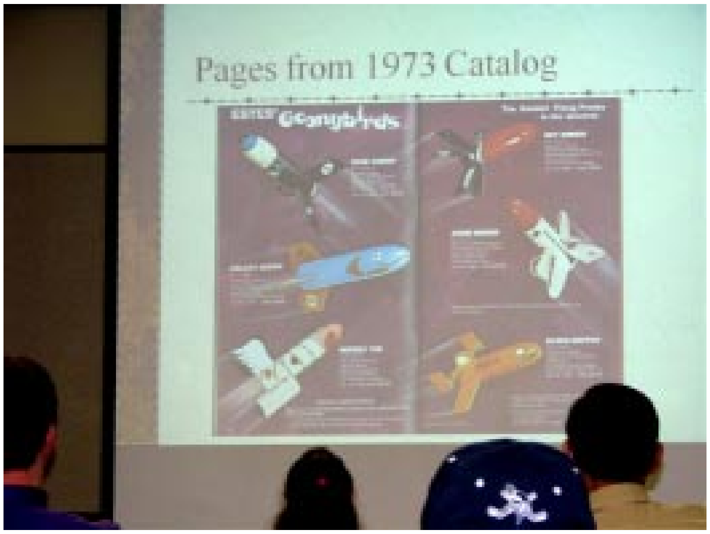


Model Of The Month

January Winners
Rick Gaff won Adult deploying his **Laser-X**.
Joey Charaska took Junior with his **Quark**.
There was no Youth entry.

February Winner
Ed Chess, won Adult with the goony "Gee Hod"
There was no Youth or Junior entry.

NIRACON



Ed Chess deilvers a talk on Goony rockets past and present.

NIRACON

Pat Butler gives a presentation on competition launching and the internationals in Spain.

NIRACON

CHAOS awards presentation, model of the year candidates, and the Lentini & Mitchel collections.

NIRACON

Kent Nebergall JPL Solar System Ambassador talks about colonizing Mars. **Rick Gaff** handles the auction.

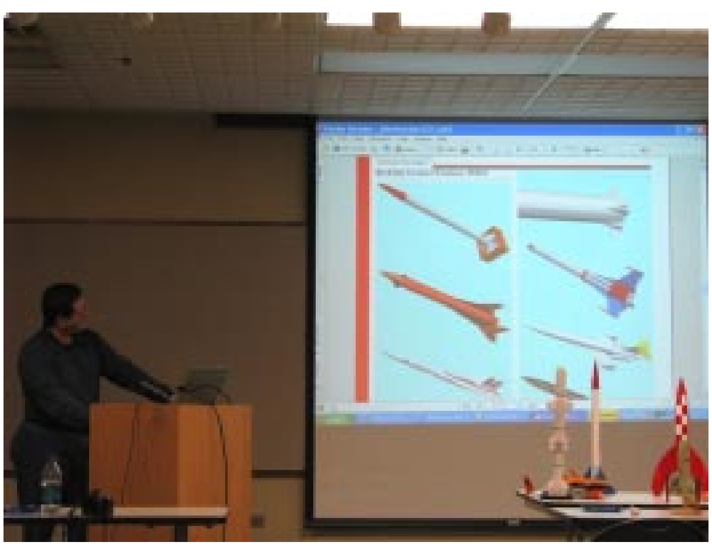
NIRACON

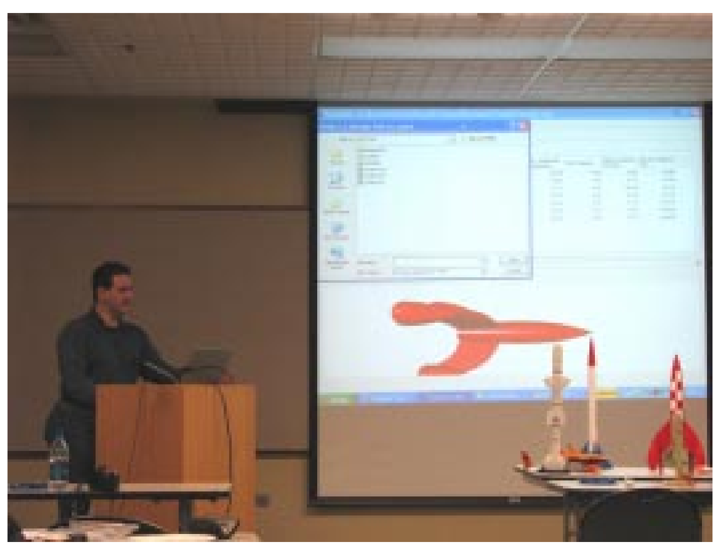





Marc Mitchell inspires the club to think small with micro engine rockets.

NIRACON





Tony Lentini shows some of the new features of Rocksim 9 and the new design possibilities.

NIRACON

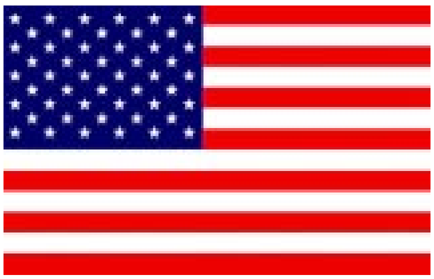




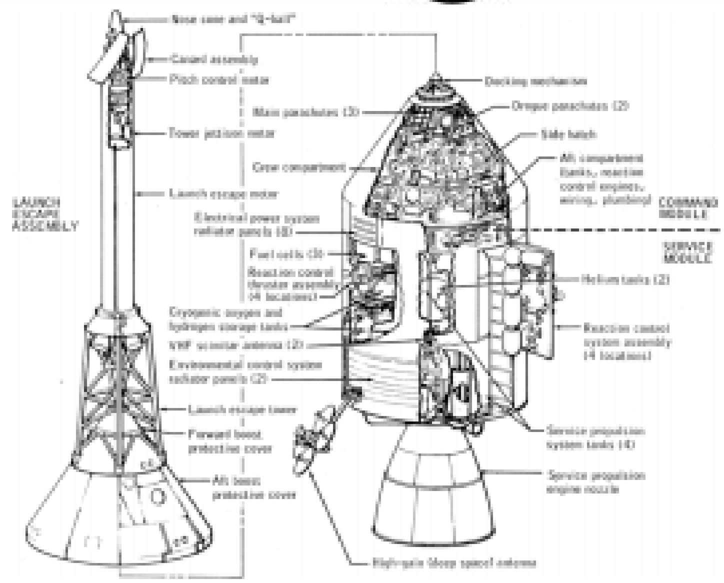

Marty Schrader displays the potential for servos and gyros for rocket stability.

East

vs.



West



Apollo
vs.
Soyuz

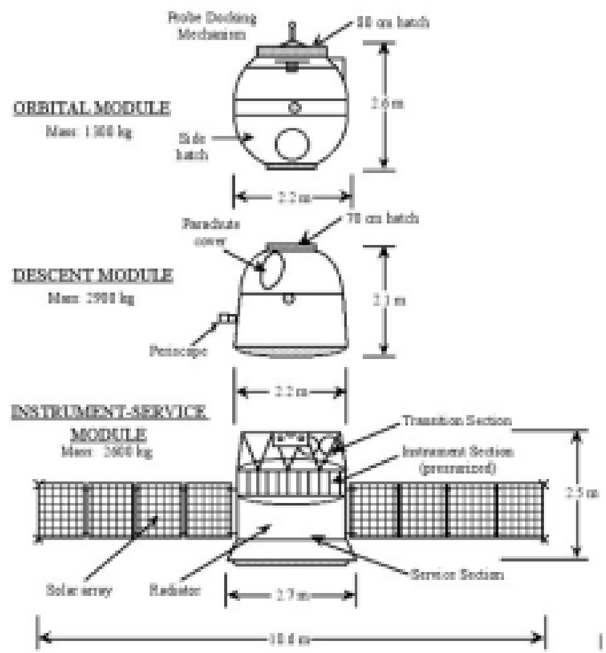
With the goal of reaching the moon established by the United States and Russia, both sides now needed new spacecraft which would carry men to lunar orbit and back. For America, this was to be the Apollo spacecraft, and for the Soviets, the Soyuz.

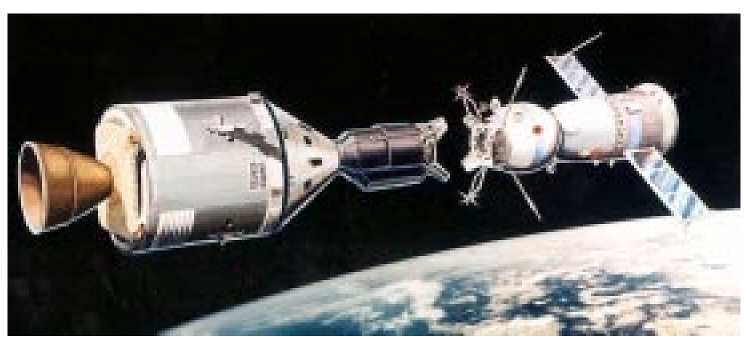
Both craft were intended to be used as part of the larger launch vehicles Saturn V and N1 respectively. Both craft could accomodate a crew of three, and provided habitation modules which doubled as re-entry craft, and service modules for life support and power.

The Soviet moon program was plagued by failure as the massive N1 moon rocket never flew sucessfully. However the Soyuz craft has been used for decades to ferry passengers to space stations including the Salyut series, Mir, and the International Space Station. Unmanned versions serve as cargo ships, and a Soyuz is always docked at the ISS to serve as an emergency life boat.

The Apollo system served in a series of earth orbiting tests to ready astronauts in the skills needed to go to the moon, and later on the actual moon landings. When the last moon landings were cancelled, the Apollo served to ferry a series of crews to the American Skylab space station.

With only one remaining Apollo spacecraft left, the decision was made to scrap the last Skylab mission in favor of a symbolic link up with a Russian Soyuz. In 1975, three astronauts and two cosmonauts spent 44 hours linked together through a special adapter, and signaled a significant thaw in the cold war.





Soyuz (pronounced [so'jus]); English: Union) is a series of spacecraft designed for the Soviet space program by the Korolyov Design Bureau. The Soyuz succeeded the Voskhod spacecraft and was originally built as part of the Soviet Manned Lunar program. The first unmanned Soyuz mission was launched November 28, 1966; the first Soyuz mission with a crew (Soyuz 1) was launched April 23, 1967, but the cosmonaut on board, Vladimir Komarov, died during the flight's crash-landing. The first Soyuz flight which the crew survived (Soyuz 3) was launched October 26, 1968.

Currently, the Soyuz spacecraft family is still in service and has launched more human spaceflight missions than any other platform. The Soyuz spacecraft is launched by the Soyuz launch vehicle, initially as part of the Soyuz program, and also as part of the unmanned Zond program. Soyuz spacecraft were used to carry cosmonauts to and from Salyut and later Mir Soviet space stations, and are now used for transport to and from the International Space Station.

A Soyuz spacecraft consists of three parts (from front to back): A spheroid orbital module, which provides accommodation for the crew during their mission; A small aerodynamic reentry module, which returns the crew to Earth; A cylindrical service module with solar panels attached, which contains the instruments and engines.

The orbital and service modules are single-use and are destroyed upon re-entry in the atmosphere. The orbital and reentry portions are habitable living space. By moving as much equipment as possible into the orbital module, which does not have to be shielded or decelerated during atmospheric re-entry, the Soyuz is both larger and lighter than the contemporary Apollo spacecraft's command module. The Apollo command module had six cubic meters of living space and a mass of 5000 kg; the three-part Soyuz provides the same crew with nine cubic meters of living space, an airlock, and a service module for the mass of the Apollo capsule alone.

Soyuz can carry up to three cosmonauts and provide life support for them for about 30 person days. The vehicle is protected during launch by a nose fairing, which is jettisoned after passing through the atmosphere. It has an automatic docking system. The ship can be operated automatically, or by a pilot independently of ground control.

The forepart of the spacecraft is the orbital module, also known as Habitation section. It houses all the equipment that will not be needed for reentry, such as experiments, cameras or cargo. The module also contains a toilet, docking avionics and communications gear. On the latest Soyuz versions, a small window was introduced, providing the crew with a forward view.

A hatch between it and the descent module can be closed so as to isolate it to act as an airlock if needed, cosmonauts exiting through its side port. This separation also lets the orbital module be customized to the mission with less risk to the life-critical descent module.

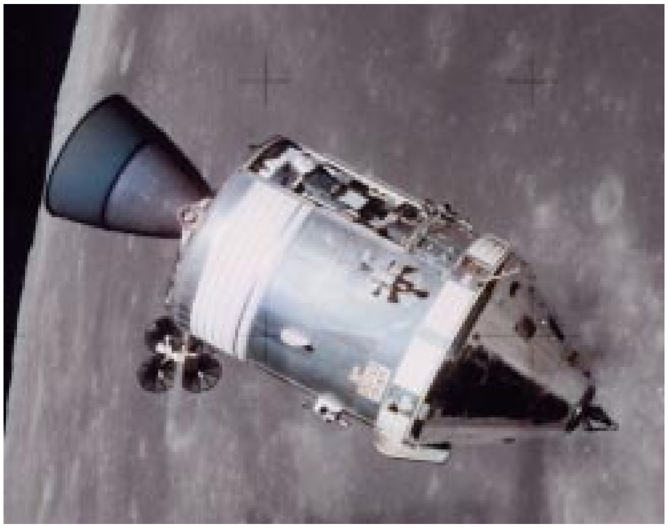
The reentry module is used for launch and the journey back to Earth. It is covered by a heat-resistant covering to protect it during reentry. It is slowed initially by the atmosphere, then by a braking parachute, followed by the main parachute which slows the craft for landing. At one meter above the ground, solid-fuel braking engines mounted behind the heat shield are fired to give a soft landing. One of the design requirements for the reentry module was for it to have the highest possible volumetric efficiency (internal volume divided by hull area). The best shape for this is a sphere, but such a shape can provide no lift, which results in a purely ballistic reentry. Ballistic reentries are hard on the occupants due to high deceleration and can't be steered beyond their initial deorbit burn. That is why it was decided to go with the 'headlight' shape that the Soyuz uses - a hemispherical forward area joined by a barely angled conical section (seven degrees) to a classic spherical section heat shield. This shape allows a small amount of lift to be generated due to the unequal weight distribution.

At the back of the vehicle is the service module. It has a pressurized container shaped like a bulging can that contains systems for temperature control, electric power supply, long-range radio communications, radio telemetry, instruments for orientation and control. A non-pressurized part of the service module contains the main engine and a spare: liquid-fuel propulsion systems for maneuvering in orbit and initiating the descent back to Earth. The ship also has a system of low-thrust engines for orientation, attached to the Intermediate compartment. Outside the service module are the sensors for the orientation system and the solar array, which is oriented towards the sun by rotating the ship.

Because its modular construction differs from that of previous designs, the Soyuz has an unusual sequence of events prior to reentry. The spacecraft is turned engine-forward and the main engine is fired for de-orbiting fully 180° ahead of its planned landing site. This requires the least propellant for re-entry, the spacecraft traveling on an elliptical Hohmann orbit to a point where it will be low enough in the atmosphere to re-enter.

Early Soyuz spacecraft would then have the service and orbital modules detach simultaneously. As they are connected by tubing and electrical cables to the descent module, this would aid in their separation and avoid having the descent module alter its orientation. Later Soyuz spacecraft detach the orbital module before firing the main engine, which saves even more propellant, enabling the descent module to return more payload. But in no case can the orbital module remain in orbit as an addition to a space station, for the hatch enabling it to function as an airlock is part of the descent module.

Re-entry firing is done on the "dawn" side of the earth, so that the spacecraft can be seen by recovery helicopters as it descends in the evening twilight, illuminated by the sun when it is above the shadow of the Earth. The Soyuz craft is designed to come down on land, usually somewhere in the deserts of Kazakhstan in central Asia. This is in contrast to early US missions which "splashed down" in the ocean.



The Apollo spacecraft was designed as part of the Apollo Program, by the United States in the early 1960s to land men on the moon before 1970 and return them safely to earth. This goal was set forth by President Kennedy after the first flight of the Mercury Space Program. The spacecraft was made up of multiple units or stages that worked together to perform the mission of landing on the moon and returning safely to earth. The main components of the Apollo spacecraft were (going from top to bottom) the launch escape system, the Command Module, the Service Module, the Lunar Module and the lunar module adapter. These stages together would sit atop the launch vehicle.

The principle was Lunar Orbit Rendezvous: A rocket would launch the spacecraft to the moon. The spacecraft would fly to the moon and orbit it. A smaller portion of the spacecraft would land on the moon and return to lunar orbit. Then a portion of the spacecraft would return to earth.

Launch vehicles: Little Joe II, Saturn I, Saturn IB, and Saturn V.

The Apollo Command/Service Module (CSM) was a spacecraft built for NASA by North American Aviation. It was one of the two spacecraft that were utilized for the Apollo program, along with the Lunar Module, to land astronauts on the Moon. Together they were called the Apollo spacecraft. After the conclusion of the Apollo program, the CSM saw service as a ferry for the Skylab program and for the Apollo-Soyuz Test Project where a CSM rendezvoused in orbit with a Soviet Soyuz spacecraft.

The spacecraft, as its name suggests, consisted of two segments, the command module (reentry capsule) which housed the crew and the equipment needed for re-entry and splashdown, and a service module that provided propulsion, electrical power and storage for various consumables required during a mission. The service module would be cast off and allowed to burn up in the atmosphere before the command module re-entered and brought the crew home.

The Command Module was a truncated cone measuring 10 feet 7 inches (3.2 m) tall and having a diameter of 12 feet 10 inches (3.9 m) across the base. The forward compartment contained two reaction control engines, the docking tunnel, and the components of the Earth Landing System. The inner pressure vessel housed the crew accommodations, equipment bays, controls and displays, and many spacecraft systems. The last section, the aft compartment, contained 10 reaction control engines and their related propellant tanks, fresh water tanks, and the CSM umbilical cables.

The command module's inner structure was an aluminum "sandwich" consisting of a welded aluminum inner skin, a thermally bonded honeycomb core, and a thin aluminum "face sheet". The central heat shield consisted of 40 individual panels interspersed with several holes and openings for the reaction control engines and after-compartment equipment access. The central compartment structure consisted of an inner aluminum face sheet with a steel honeycomb core, a glass-phenolic ablative honeycomb heat shield, a layer of q-felt fibrous insulation, a pore seal, a moisture barrier, and a layer of aluminized PET film thermal strips.

The aft heat shield consisted of four brazed honeycomb panels, four spot-welded sheet metal fairings, and a circumferential ring. The fairing segments were attached to the honeycomb panels and ring with conventional fasteners. The steel honeycomb core and outer face sheets were then thermally bonded to the inner skin in a giant autoclave.

The central pressure vessel of the command module was its sole habitable compartment. It had an interior volume of 210 cubic feet (5.9 m^3) and housed the main control panels, crew seats, guidance and navigation systems, food and equipment lockers, the waste management system, and the docking tunnel.

The Service Module was an unpressurized cylindrical structure, measuring 24 feet 7 inches (7.5 m) long and 12 feet 10 inches (3.9 m) in diameter. It housed the service propulsion system and its propellants, the fuel cell power system, four maneuvering thruster quads, the S-band antenna for communication with Mission Control, and storage tanks for water and air. On Apollo 15, 16 and 17 it also carried a scientific instrument package. It was connected to the Command module using three tension ties and six compression pads. The tension ties were stainless steel straps bolted to the CM's aft heat shield.

The Service module remained attached to the Command Module throughout the mission. It was jettisoned just prior to re-entry into the earth's atmosphere. The Service Module was a simple structure consisting of a center section and six pie-shaped sectors. The basic components were the forward bulkhead and fairing, six radial beams, four honeycomb panels, and the aft bulkhead and heat shield.

Four clusters of reaction control jets were installed around the upper section of the SM every 90 degrees. Each thruster generated approximately 445 N of thrust, and used MMH for fuel and N204 as oxidizer. Each quad assembly measures 8 by 3 feet (2.4 by 0.9 m) and has a single fuel tank, an oxidizer tank, and its associated valves and regulators.

The central tunnel housed the service propulsion engine and its two helium pressurant tanks. The engine used Aerozine 50 (hydrazine/UDMH) fuel and nitrogen tetroxide oxidizer and had a maximum thrust of 20,500 lbf (91.2 kN). It is 152.82 inches (3.882 m) long and 98.48 inches (2.501 m) wide at the base.

Also on the SM exterior were a retractable forward-facing spotlight, an EVA floodlight, and a flashing rendezvous beacon visible from 100 kilometers away. Following jettison, the SM translation jets automatically fired aft to distance it from the CM. The roll jets were fired for five seconds to ensure faster break-up on re-entry.

Copied from Wikipedia

East

vs.

East

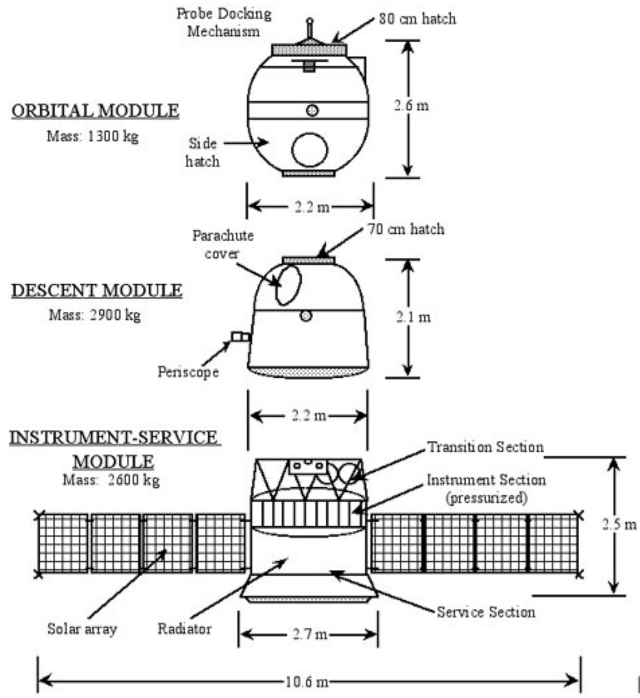
Soyuz
vs.
Shenzhou

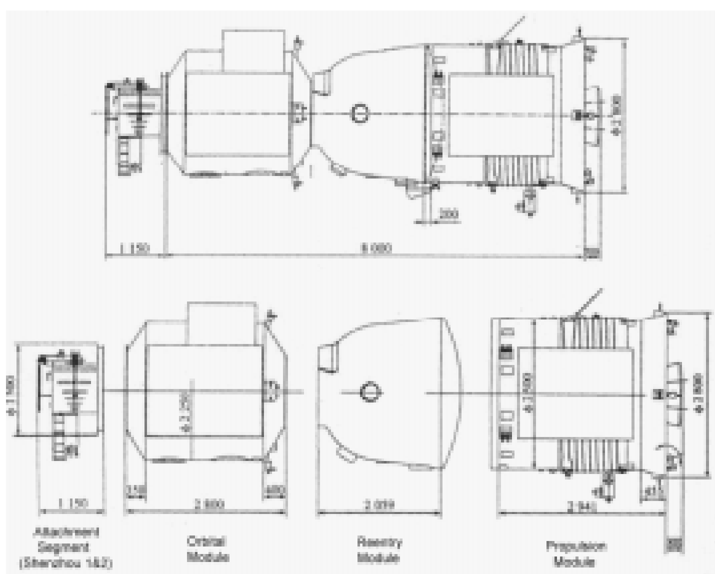
In 2003, China joined the United States and Russia as the only countries with manned spaceflight capability. Using the Long March rocket, the Shenzhou carried a lone Chinese pilot into orbit on October 15 of 2003.

The Shenzhou bears an immediate similarity to the Russian Soyuz in it's three part modular design. Both craft utilize an aft propulsion / life support module with solar wing arrays, a mid-body re-entry vehicle, and a forward science module. The forward module of the Shenzhou is much larger than that of the Soyuz and mounts an extra set of solar panels.

The forward module is referred to as an 'orbital module' and also carries it's own propulsion system. After the re-entry module has detached and returned to earth, the orbital module can continue to operate independantly performing a variety of scientific or military missions. The Soyuz forward module has no such capability, and burns up after being detached from the re-entry module.

It has been suggested that a number these orbital modules might be joined together to create or be added to a future space station.





Shenzhou Spacecraft Overall Size

Shenzhou is a spacecraft developed by the People's Republic of China to support its manned spaceflight program. Its design is based on the Russian Soyuz spacecraft, but is larger. The first manned launch was on October 15, 2003.

Development began in 1992, under the name of Project 921-1. The Chinese National Manned Space Program was given the designation Project 921 with Project 921-1 as its first significant goal. The plan called for a manned launch in October 1999, prior to the new millennium.

It is launched on the Long March 2F from the Jiuquan Satellite Launch Center. The command center for missions is the Beijing Aerospace Command and Control Center. The first four unmanned test flights happened in 1999, 2001 and 2002. These were followed by manned launches on October 15, 2003, October 12, 2005 and September 25, 2008.

The name is variously translated as "Divine Craft", "Divine Vessel of the Gods" or similar, and is identically pronounced, though differently written, with a literary name for China (literally "Divine Land").

The Shenzhou spacecraft closely resembles Soyuz, although it is substantially larger, and unlike the Soyuz, it features a powered orbital module capable of autonomous flight.

The similarity in outward appearance between Shenzhou and Soyuz arises partially from basic constraints on space flight. Like Soyuz, Shenzhou consists of three modules: a forward orbital module, a reentry capsule in the middle, and an aft service module. This division is based on the principle of minimizing the amount of material to be returned to Earth. Anything placed in the orbital or service modules does not require heat shielding, and this greatly increases the space available in the spacecraft without increasing weight as much as it would if those modules were also able to withstand reentry. Thus both Soyuz and Shenzhou have more living area with less weight than the Apollo CSM.

The orbital module contains space for experiments, crew-serviced or operated equipment, and in-orbit habitation. Without docking systems, Shenzhou 1~6 carried different kinds of payload on the top of their orbital modules for scientific experiments.

Unlike the Soyuz, the Shenzhou orbital module is also equipped with its own propulsion, and control systems, allowing autonomous flight. It is possible for Shenzhou to leave an orbital module in orbit for redocking by a later spacecraft, something which the Soyuz cannot do since the hatch enabling it to function as an airlock is part of its descent module. In the future it is possible that the orbital module(s) could also be left behind on the planned Chinese project 921/2 space station as additional station modules. The fact that China has yet to deploy a space station (e.g., something equivalent to Salyut such as a module that has been re-docked with after deployment) implies an equivalent stage of progress to Russia pre-1970.

In the unmanned test flights launched to date, the orbital module of each Shenzhou was left functioning on orbit for several days after the reentry capsules return, and the Shenzhou 5 orbital module continued to operate for six months after launch.

The reentry module is located in the middle section of the spacecraft and contains seating for the crew. It is the only portion of Shenzhou which returns to Earth's surface. Its shape is a compromise between maximizing living space while allowing for some aerodynamic control upon reentry.

The aft service module contains life support and other equipment required for the functioning of Shenzhou. Two pairs of solar panels, one pair on the service module, the other pair on the orbital module, have a total area of over 40 m^2 (430 ft^2), indicating average electrical power over 1.5 kW (Soyuz have 1.0 kW).

It has been stated by some sources that Shenzhou 8 would be an "8-ton small space laboratory" or "8-ton space station", and Shenzhou 9 and Shenzhou 10 will dock with it; but at 29 Sept. 2008, Zhang Jianqi, Vice Director of China manned space engineering, declared in an interview of China Central Television it is Tiangong 1 (i.e. not Shenzhou 8) that will be the 8-ton "target vehicle", and Shenzhou 8, Shenzhou 9 and Shenzhou 10 will all be spaceships to dock with Tiangong 1 in turn.

China's first efforts at human spaceflight started in 1968 with a projected launch date of 1973. Although China did launch an unmanned satellite in 1970 and has maintained an active unmanned program since, this attempt was canceled due to lack of funds and political interest. The current Chinese human spaceflight program was authorized on April 1, 1992 as Project 921/1, with work beginning on January 1, 1993. The initial plan had three phases:

Phase 1 would involve launch of two unmanned versions of the manned spacecraft, followed by the first Chinese manned spaceflight, by 2002. Phase 2 would run through 2007, and involve a series of flights to prove the technology, conduct rendezvous and docking operations in orbit, and operate an 8-tonne spacelab using the basic spacecraft technology. Phase 3 would involve orbiting of a 20-ton space station in the 2010-2015 period, with crews being shuttled to it using the eight-ton manned spacecraft.

The fifth launch, Shenzhou 5, was the first to carry a human (Yáng Lìwei) and occurred at 9:00 CST (UTC +8) on October 15, 2003.

Copied from Wikipedia

All The News That Fits To Print

Mischievous Raccoon Wreaks Havoc On International Space Station

The pesky raccoon that has turned the ISS upside down.

MOSCOW—Orbiting the earth aboard the International Space Station, Expedition 9 scientists were chagrined to report a bevy of equipment and supply problems stemming from the behavior of an inquisitive raccoon Monday.

"Yesterday, we found fruit rinds in the EVA suits and helmets, and the day before, it was garbage strewn all over the Pirs Docking Module," ISS Science Officer Mike Fincke said via a video-link to Russian mission control. "Today, a controller on the starboard truss failed because the power cord was chewed clean through. The little guy's curious, that's for sure."

Both Fincke and Expedition 9 Commander Gennady I. Padalka of Russia reported surprise run-ins with the raccoon. Padalka said he was startled to find the stowaway nesting in the centrifuge accomodation module and Fincke said that the mischievous animal scurried underfoot as he was replacing a failed remote power controller module on a recent spacewalk and knocked him into a weightless spin.

Fincke said he traced the recent contamination of the ISS water supply back to the raccoon's habit of washing its food before eating it. The American officer added that the space station's external-refuse cylinders are regularly turned over and rummaged through—especially on nights when the crewmembers have consumed fish dinners or freeze-dried "astronaut ice cream."

Neither of the two scientists has been able to outsmart the wily animal, despite weeks of effort.

"Although the ISS is mankind's best-planned space station, it regrettably has no plans for dealing with pesky wildlife," said Padalka, who has been appointed temporary pest-control officer for the ISS. "We've put out Havahart traps, but the little bandit somehow always makes off with the bait. Evidently, due to zero gravity, the raccoon does not weigh enough to depress the trigger-plate."

While capturing the animal remains a top priority, Expedition 9 crewmembers are determined not to harm the sneaky little guy.

"Heck, if we announced we were going to exterminate him, mission control would go berserk," Fincke said. "They can't get enough of his antics."

"He is devious, this one," Padalka said, chuckling. According to Padalka, the little critter's mischief does provide the crew with much-needed entertainment.

When Padalka opened his locker last week and found an orbiting thundercloud of rumpled wrappers in place of his private supply of Snickers bars, Fincke laughed so hard he spit out the pouch of water he'd been drinking. However, Fincke was not the one laughing when he spotted the playful creature running off wearing his spare Orlan-M spacesuit helmet. But both astronauts could enjoy seeing the bewildered raccoon scrambling to keep up with the zero-gravity treadmill, after having apparently triggered its "quick-start" switch.

"You have to give it to the little guy, he's persistent," said Fincke, who, while calibrating the ISS telescope last week, had a rare opportunity to view the raccoon up close, when its masked, bewhiskered face stared back at him through the telescope's other end.

Fincke reported another recent run-in with the confounded varmint.

"I shooed him out of the Unity module, but then Padalka got me on the intercom, and the critter, seeing I was distracted, slipped in behind me and got his deft, furry little paws on the controls for the gyroscopes that stabilize the platform's flight. Before we knew it, the danger lights were strobing, the alarms were going off, and the whole station was upside-down."

Although NASA has been unable to determine how the animal got on board, lab analysis of the beast's droppings suggests that it's the same raccoon that caused hell and tarnation on the ISS during Expedition 7 in 2003. While none of the previous crew's members would admit to feeding the raccoon—which would explain its return—many expressed affection for the animal.

"I call raccoon Kosmo-Rascal, after favorite children's book," Expedition 7 Commander Yuri Malenchenko said. "If we caught him, I think we might have used him in benign experiment, maybe about training to do tricks. Is true nobody wants air filter clogged with nutshells, but nobody wants raccoon hurt, either. So?"

ISS personnel agree that, while unexpected, the raccoon is not entirely unwelcome.

"This is how astronauts learn to deal with new things—by living through them," Fincke said. "Zero gravity, environmental adaptation, varmints... all these are unplanned things that surprise us when we take a step into space. But we aboard ISS Expedition 9 haven't met a problem too big for us yet, and we'll work this raccoon thing out sooner or later. Hopefully, before the clever little dickens figures out how to work the airlocks."

Russian mission control monitors the actions of the furry little devil.

If the Government Stops Funding Space Exploration...

Sci-Fi Classics
When Worlds Collide / Space Ark