



*As millions watched around the world, 11,000 witnessed the launch of Space Shuttle Endeavour with their naked eyes from Kennedy Space Center in Merritt Island, Fla. The launch pad, four miles from the viewing site across Banana River, posed a majestic ambience, fittingly offset by a full moon hovering overhead. Patriotic camaraderie swelled as everyone sang the national anthem in unison. Then, as the countdown began, voices cracked in emotion with the sounding of the numbers, as tears freely flowed down their faces. The roar of the rockets was thunderous, like nothing most had ever heard before. No one moved until the shuttle entirely disappeared into the clouds and could be seen no more. The viewing was over but the mission had just begun for Civil Air Patrol's own Eric Boe, who was piloting that shuttle. It was amazing and truly awesome to imagine his task ahead.*

# CAP's Cadet Program Helped Launch Astronaut's Ambitions

*By Kimberly L. Wright*

Photo courtesy of NASA



Air Force Col. and CAP Sr. Mbr. Eric Boe's life is filled with distinctions.

He distinguished himself as a CAP cadet, earning the Cadet Program's highest honor — the Gen. Carl A. Spaatz Award — and gaining recognition as Cadet of the Year at the national, region and wing levels. He distinguished himself in the Air Force as a combat and test pilot. And he distinguished himself in the NASA space program, which led to his selection as pilot of the Space Shuttle Endeavour in November 2008.

As a poignant reminder of the organization that helped shape his dreams, Boe took his CAP Spaatz coin with him into space.

"I was excited about going into the military before I was in Civil Air Patrol, but getting in Civil Air Patrol enhanced what I was thinking about," said Boe, who became a cadet in 1977 with the Georgia Wing's Atlanta Composite Squadron 2. "I was very

Astronaut Eric Boe displays the Gen. Carl A. Spaatz coin he received when he earned Civil Air Patrol's top cadet award. In tribute to his CAP roots, Boe took the coin into space with him during his November 2008 space shuttle mission.



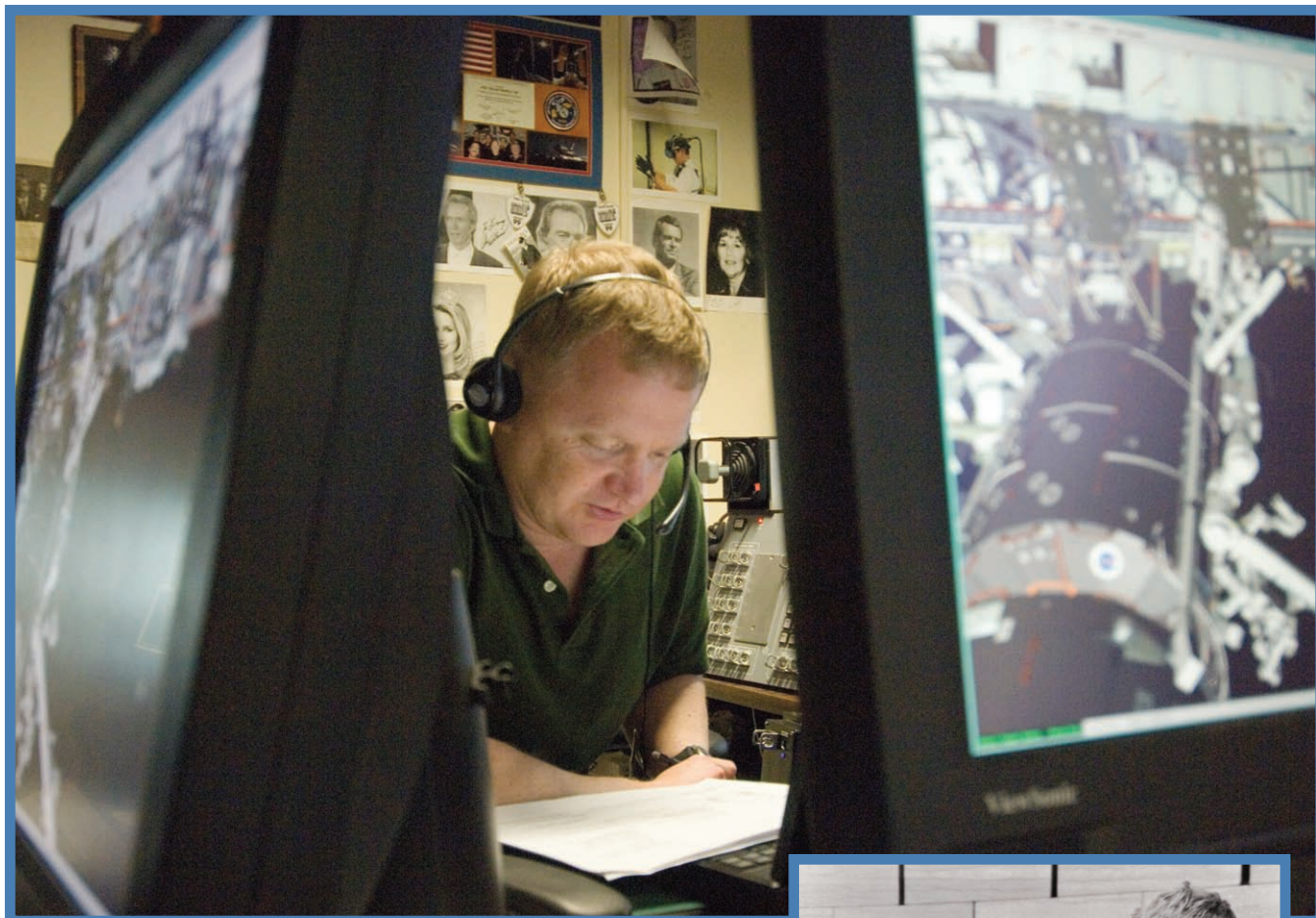


Photo courtesy of NASA

Boe, STS-126 pilot, uses the virtual reality lab in the Space Vehicle Mockup Facility at NASA's Johnson Space Center to train for some of his duties aboard the space shuttle and space station. Right, Cadet Boe studies a model of the space shuttle during a 1981 CAP-related trip to the National Air and Space Museum in Washington, D.C.



Photos by Lt. Col. Philip Bowden, Georgia Wing

interested in aviation, and I got to go to bases to see fighters and talk to fighter pilots. Those kinds of experiences helped me in the military.

"One of the really cool things about Civil Air Patrol as a cadet is you can experience a kind of mini-career," he added. "You start at the airman basic level and can go all the way up to cadet colonel, and you can go through the different phases in short order."

Lt. Col. Philip Bowden, Boe's CAP squadron commander, said Boe was an inspirational cadet commander.

"At some point, Eric gave the cadets a cadence chant that included the words, 'highly motivated, truly dedicated,' and that was Eric himself," said Bowden. "He

was always charged with energy, eager to take on the next challenge — and the tougher the better — but at the same time, I never saw him stressed or tense about anything. I know it's a contradiction, but Eric as a cadet was an easy-going ball of fire.

"Eric was always out front, leading the cadets, and obviously having the time of his life," he said. "I was right behind him, out of breath, but also having the time of my life. As a squadron commander, having Eric Boe as cadet commander was just plain fun."

Boe received a solo scholarship at age 16, later soloing in a Cherokee 140 during a Georgia Wing encampment. Thanks to his CAP flight experience, he was able

to hit the ground running as a military pilot.

"That was my first real opportunity to fly an airplane by myself," he said. "CAP gave me that opportunity, and it made a difference

in the long term. It's always nice to have flown before you show up at pilot training."

The Cadet Program's diverse educational opportunities did more than simply serve as a launching pad for Boe's career. They expanded his horizons and enriched his life.

"That's one of the things I like about CAP," Boe said. "It gives you exposure to a lot of different things, and all of these things build on themselves. There are many different missions — emergency services, rescues and things like that. I really enjoyed that part of the program."

In addition to typical weekend cadet activities like encampments and trips to such venues as the National Air and Space Museum in Washington, D.C., Boe benefited from national-level activities, such as the Air Force Pararescue Orientation Course and the International Air Cadet Exchange, which introduces youth in air cadet programs across the globe to different cultures.

"It was good exposure to see people from other countries, and now I'm working on the

International Space Station," he said. "I was stationed in the Philippines in the military, and with NASA I was in Russia for a year with my family. That initial IACE experience gave me a flavor for the international experiences I have had so far."

Boe also values the respect for aviation history he learned in the Cadet Program.

"In some ways I got better exposure to aviation history through CAP than just about anywhere else," he said. "I still use the lessons from aviation I learned in CAP and the Air Force."

Boe realized his dream of an Air Force aviation career when he graduated from the Air Force Academy and became a top-notch pilot. His military service included flying 55 combat missions over Iraq in support of Operation Southern Watch after the Gulf War and more than 4,000 flight hours in more than 45 different aircraft. His military decorations include

the Meritorious Service Medal, Air Medal and Aerial Achievement Medal.

None compares, though, to serving as pilot of Endeavour, his first space mission.

"I'm very excited to go into space and to represent the nation," he said in a preflight interview. "I have my ideas of what it's going to be like, but you know, it's just like



Boe is presented Civil Air Patrol's Amelia Earhart Award by U.S. Rep. Newt Gingrich, R-Ga., in this 1982 photo.



Boe accepts CAP's Outstanding Cadet of the Year plaque from Air Force Lt. Gen. Charles G. Cleveland, left, commander of Air University. On hand for the presentation were Air Force Brig. Gen. David L. Patton, second from left, CAP-USAF commander and executive director of CAP, and Brig. Gen. Howard L. Brookfield, right, CAP national commander. In this 1983 photo, Boe is dressed in a U.S. Air Force Academy cadet uniform.



everything you do in life. When you get there, it's always a little different than you expected. So, I'm looking forward to seeing what it's like, seeing what the environment is like and really excited to go to the International Space Station. It's a huge international effort, and I'm honored to get the chance to represent our country to the world and what we're doing in space."

Among the well-wishers in attendance at the launch was his proud former squadron commander, Bowden.

"As for witnessing Eric's first flight into space, allow me to quote a bit from my letter to him," said Bowden. "I grew up on science fiction... [Those] stories put me into rocket ships to other worlds experiencing great adventures. The exploration of space is humanity's greatest adventure. And in you I have the delight and honor of knowing one of our daring explorers. What joy you have brought to this old man's heart and to the little boy within who dreamed of rocket ships. Endeavour is indeed a proper rocket ship! And you, my friend, are indeed a proper rocket ship pilot! Thanks again for your loyalty and kindness in remembering me and sharing the greatest adventure of your life. Mars or bust!"

During his tenure at NASA, Boe helped craft the new vehicle that will take humanity further into the solar system — the Crew Exploration Vehicle, which, unlike the shuttle, is designed to go beyond Earth's orbit. With the CEV in its arsenal, the future is wide open for NASA exploration.

"NASA's going back to the moon, going to Mars and looking at exploring our solar system," said Boe. "It's a very interesting time. I hope to get the opportunity to do another shuttle mission. I'd also like to fly in the space station and then, hopefully, to work on some of the initial Crew Exploration Vehicle missions."

Boe also dreams of one day going to the moon. "A lot of that would be timing with what's going on. But to get the opportunity would be awesome," he said.

Will Eric Boe be the first CAP member on the moon? Stay tuned! ▲

## Boe's Breakthroughs

- Joined CAP in 1977 as a cadet, currently a senior member.
- Graduated with honors, astronautical engineering, U.S. Air Force Academy, 1987.
- Awarded Fannie and John Hertz Foundation Fellowship for graduate studies, 1987.
- Earned master's degree in electrical engineering, Georgia Institute of Technology, 1997.
- Flew 55 combat missions over Iraq in support of Operation Southern Watch after the Gulf War.
- Served as director of Test, Air-to-Air Missile Test Division, Eglin Air Force Base, Fla.
- Logged more than 4,000 flight hours in more than 45 different aircraft.
- Selected as a NASA pilot in July 2000; reported to Johnson Space Center, Houston, and after completion of two years of training, was assigned technical duties in the Astronaut Office Advanced Vehicles Branch, Station Operations Branch and Space Shuttle Branch.
- Served as NASA director of operations at Gagarin Cosmonaut Training Center, Star City, Russia, October 2005-2006.
- In Exploration Branch, worked on new Crew Launch Vehicle and Crew Exploration Vehicle.
- Served as pilot of Space Shuttle Endeavour, November 2008.
- Awarded the following military decorations: two Meritorious Service Medals, two Air Medals, five Aerial Achievement Medals, three Commendation Medals, Achievement Medal, three Outstanding Unit Awards and Combat Readiness Medal.

Boe aided in the conception of the Crew Exploration Vehicle, the space shuttle's eventual replacement, designed to take humanity back to the moon and beyond.



Photo courtesy of NASA

# How do you learn to land a shuttle? **Start by soloing as a CAP cadet**

*By Capt. Steven Solomon*

Space Shuttle Endeavour's drag chute deploys as it rolls down Runway 04L at Edwards Air Force Base moments after landing on Nov. 30, 2008.



Photo courtesy of NASA

**A** After a 15-day mission to the International Space Station, it was time for Space Shuttle Endeavour to come back to Earth. The return on Nov. 30, 2008, was anything but routine.

First, a weather front with high crosswinds and thunderstorms was approaching the prime landing site at NASA's Kennedy Space Center in Florida, so mission managers decided to divert STS-126 to the backup location at Edwards Air Force Base, Calif. And then there was the matter of the main runway at Edwards being out of service because of maintenance, and the temporary runway being 3,000 feet shorter and 100 feet narrower than the main runway.

But for shuttle pilot Eric Boe, a senior member of Civil Air Patrol's Florida Wing, something seemed familiar.



“In a lot of ways, they’re very similar,” he said when comparing his first landing as a 16-year-old CAP cadet at a Georgia Wing flight encampment to landing a space shuttle for the first time. “Both were very exciting, but it was what I expected.”

That’s because Boe had practiced shuttle landings on a temporary runway in a jet that was modified to simulate a shuttle’s cockpit, motion and visual cues, and handling qualities. In flight, the aircraft duplicates the shuttle’s atmospheric descent trajectory from approximately 35,000 feet to landing.

“I got to fly the space shuttle as a glider. I flew it from the 180-degree turn to the 90-degree turn. We did a pull-up toward the field. At 300 feet I put the landing gear down. The real challenge is to get a nice deceleration.”

Noting that as pilot his primary role was to back up the shuttle commander as another set of eyes, Boe said he called out key points on a heads-up display to ensure the instruments matched up to reality.

“I’m checking radars. Speed breaks. Preflair. As you get closer, the calls get tighter.”

While Boe was doing this, he had support from six CAP California Wing members who assisted NASA during the landing as part of the Air Force Flight Test Center Shuttle Recovery Team. They took high-resolution photos of the orbiter from a CAP GA-8 Airvan and sent them via satellite phone back to the command



STS-126 Commander Chris Ferguson, at the microphone, thanks employees of NASA's Dryden Flight Research Center for their support of Space Shuttle Endeavour's landing at Edwards Air Force Base in California. With him are, from left, astronauts Heidemarie Stefanyshyn-Piper, Eric Boe, Steve Bowen, Shane Kimbrough and Donald Pettit.

post. The images allowed NASA to see what was happening to the orbiter as it landed.

“The colors were truly amazing, so vivid and vibrant. It looked surreal,” Boe said. “You can really see our world is living.”

Touchdown for the seven astronauts aboard was at 4:25:22 p.m. EST.

Boe returned with a CAP seal and the Gen. Carl A. Spaatz Award coin he took with him into space in honor of his CAP cadet experience.

He has been a regular speaker at CAP’s annual summer Air Force Space Command Familiarization Course at Patrick Air Force Base, Fla. One of the things he wants to do as soon as possible is speak again to the cadets, who always ask for advice on how they too can someday be an astronaut.

Boe’s suggestion: “Find something you love to do. Pursue your dreams. Dream big. Keep pursuing your goals.” ▲



Photo courtesy of NASA

With a colorful Earth and the blackness of space as a background, the STS-126 crew photographs the Leonardo Multi-Purpose Logistics Module, which held materials used in the International Space Station's expansion.

Civil Air Patrol National Commander Maj. Gen. Amy S. Courter witnessed the night launch of Space Shuttle Endeavour at Kennedy Space Center in Florida, the first flight of a CAP member into space.

The STS-126 patch depicts the Space Shuttle Endeavour on its mission to help expand the International Space Station.



Photo courtesy of NASA

Photo by Susan Robertson, CAP National Headquarters



Astronauts Eric Boe, left, and Steve Bowen perform mission duties on the mid-deck of the Space Shuttle Endeavour.

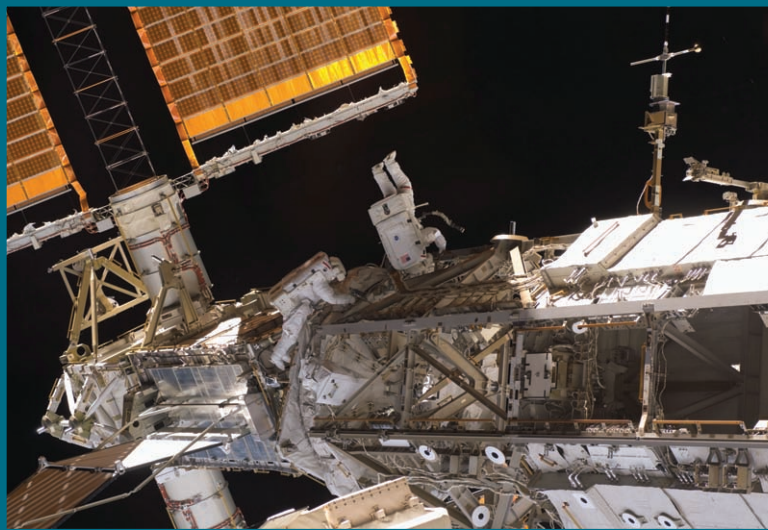


Photo courtesy of NASA



Astronauts Heidemarie Stefanyshyn-Piper, left, and Shane Kimbrough, both STS-126 mission specialists, participate in a spacewalk as part of continued construction and maintenance of the International Space Station.

Photos courtesy of NASA



The crew of the Space Shuttle Endeavour, Mission STS-126, walks out of the Operations and Checkout Building and heads for the Astrovan that will take them to Launch Pad 39A. CAP member Eric Boe is shown on the left, front row, before his first space flight.



Boe enjoys the view while on the flight deck of Space Shuttle Endeavour.

Boe floats near the hatchway of the Leonardo Multi-Purpose Logistics Module temporarily docked with the International Space Station to aid in the transfer of supplies and hardware. Boe's flying experience laid the foundation for his career as a NASA pilot.

# Pararescuemen

## CAP Cadet Among Those Trained to Serve

By Kimberly L. Wright



Mounted atop a modified Boeing 747 shuttle carrier aircraft, Space Shuttle Endeavour heads toward NASA's Kennedy Space Center in Florida after a stopover in Texas. The 45th Space Wing assisted in transport of the shuttle from its landing spot at Edwards Air Force Base, Calif., after bad weather prevented a Florida landing. Air Force pararescueman Sr. Airman Tom Culpepper is a part of a multiagency support system for shuttle missions.

Photo courtesy of NASA

**T**he Air Force's 45th Space Wing performs a service it hopes will not be used. Still, wing members stand by in HH-60G Pave Hawk helicopters and airborne C-130s, some at the launch site for security and others for search and rescue support in case something goes wrong with a shuttle during launch. Among the wing's dedicated men and women is former Civil Air Patrol cadet and Air Force Sr. Airman Tom Culpepper, a member of the 58th Rescue Squadron out of Nellis Air Force Base, Nev.





Air Force pararescueman Sr. Airman Tom Culpepper, kneeling, is shown at his Air Force pararescue graduation in September 2006 with friends he met in CAP — from left, Lt. Col. Peter Bowden, Stephen Langone, Leo Leonato and Colin Greata. The class demonstrated their skills for the friends and families assembled. Langone is a prospective pararescueman.

Culpepper has something in common with Space Shuttle Endeavour pilot Eric Boe besides their cadet heritage. Both tenaciously underwent years of preparation for their current jobs and both attended CAP's Air Force Pararescue Orientation Course as cadets. The course, which introduces youth to the basics of life as a

pararescueman, made a lasting impression on Culpepper.

Air Force pararescuemen undergo some of the U.S. military's toughest training. The journey begins with a preliminary test, and those who pass advance to tryouts. The program has an 80-85 percent failure rate.

"You basically get pushed to your limits," said Culpepper. "It's a mind-over-matter type thing."

Culpepper beat the long odds, graduating from the program at Kirtland Air Force Base, N.M., in September 2006. From start to finish, it took him about three years.

He credits CAP with helping him gain the grit to make it: "CAP gave me some of the base-level maturity I picked up, and it is probably the biggest thing it did for me."

Culpepper is not the only former CAP cadet who has completed the program. "I know of two others that I work with," he said, "and another in training."

## The 45th Space Wing

Based at Patrick Air Force Base, Fla., the 45th Space Wing's responsibilities include supporting unmanned rocket launches and space shuttle launches and landings. Support for the shuttle includes training for rescue scenarios, launch security, weather assessments for landings and assistance with landing. A multitude of agencies help the 45th Space Wing with their missions, including

## Culpepper's Cadet Experience

Tom Culpepper's CAP mentor, Lt. Col. Peter K. Bowden, now of the Florida Wing, first met him in 1994 when Culpepper transferred to the National Capital Wing's Fairfax Composite Squadron.

Bowden said of Culpepper: "Tom was a lot like me as a cadet; he enjoyed CAP more than he enjoyed school. He was one of those young people who just 'get it,' and he made my job easy. You almost had to treat him like an adult, because he was mature beyond his age."

An energetic cadet, he found a variety of ways to serve, and ultimately became cadet commander. "Tom was the cadet I called on to install a radio in the squadron van or to create a recruitment training program for cadets from scratch," said Bowden. "He did both of these things and more. In 1996 he built a squadron Web site before most people had a home e-mail account."

When he became a senior member, Culpepper served as squadron leadership officer. Though he entered the Air Force in January 2004, his legacy in the squadron lives on.

"We named an award after him called the Thomas H. Culpepper Award," said Bowden, "which is presented to the honor graduate of our basic cadet training flight."

Culpepper's 58th Rescue Squadron.

For the launch of NASA mission STS-126, Culpepper was stationed in Long Island, N.Y., one of five sites in the U.S. and abroad on standby. The team, part of a multiagency arsenal, trains regularly for search and rescue scenarios to ensure the highest possible success if faced with a critical situation. Culpepper's training includes swift water rescue, close-quarters combat, confined space rescue, black water dive rescue, high angle rescue and snow and ice rescue.

"My role (and the role of all PJs for a launch) is to provide contingency coverage in case of an abort after launch," said Culpepper. "In case of emergency, we would launch in a C-130 to the incident site, deploy our Zodiac boats by parachute into the ocean and then parachute down after them. Once we enter the water, we would inflate the boats and start searching for and recovering the astronauts that bailed out. Then we provide medical treatment until helicopters or a nearby ship can reach us, at which point we would facilitate their extraction and continue medical care until a higher level of care arrives to take over."

Culpepper was excited to be part of the mission, par-

ticularly since a fellow CAP member was piloting the shuttle. "It was very cool thing to find out," he said, "definitely cool to be a part of it."

This is the fourth launch Culpepper has supported. A relative newbie, he has not participated in a search and rescue mission.

Beyond providing a safety net in case of a critical situation, the 45th Space Wing supported the shuttle mission in other ways. For instance, bad weather at the primary landing site forced the Endeavour to land at an alternate site at Edwards Air Force Base, Calif. Members of the 45th Space Wing accompanied the shuttle as it was piggybacked atop another craft back to Kennedy Space Center, Fla.

"It feels great to do what I do," said Culpepper. "To be able to say my job is to train and prepare to ensure our military men and women come home by whatever means necessary is something I take great pride in. The Air Force gives us the best training and equipment available to ensure that when the time comes, we are ready to save that life and bring someone home. I think the last line of the PJ creed sums it up well. 'These things we do, that others may live.' " ▲

Photo by LT. Col. Philip Bowden, Georgia Wing



Pararescueman Tom Culpepper takes part in exercises in the Horn of Africa in support of the War on Terror.

## About the Pararescue Mission

Air Force Special Operations Command pararescuemen, also known as PJs, are the only Department of Defense specialty specifically trained and equipped to conduct conventional or unconventional rescue operations.

A pararescueman's primary function is as a personnel recovery specialist, with emergency medical capabilities in humanitarian and combat environments.

PJs deploy in any available manner, including air-land-sea tactics, into restricted environments to authenticate, extract, treat, stabilize and evacuate injured personnel while acting in an enemy-evading, recovery role. They participate in search and rescue, combat search and rescue and recovery support for NASA and conduct other operations as appropriate.

— Source: U.S. Air Force



# The International Space Station

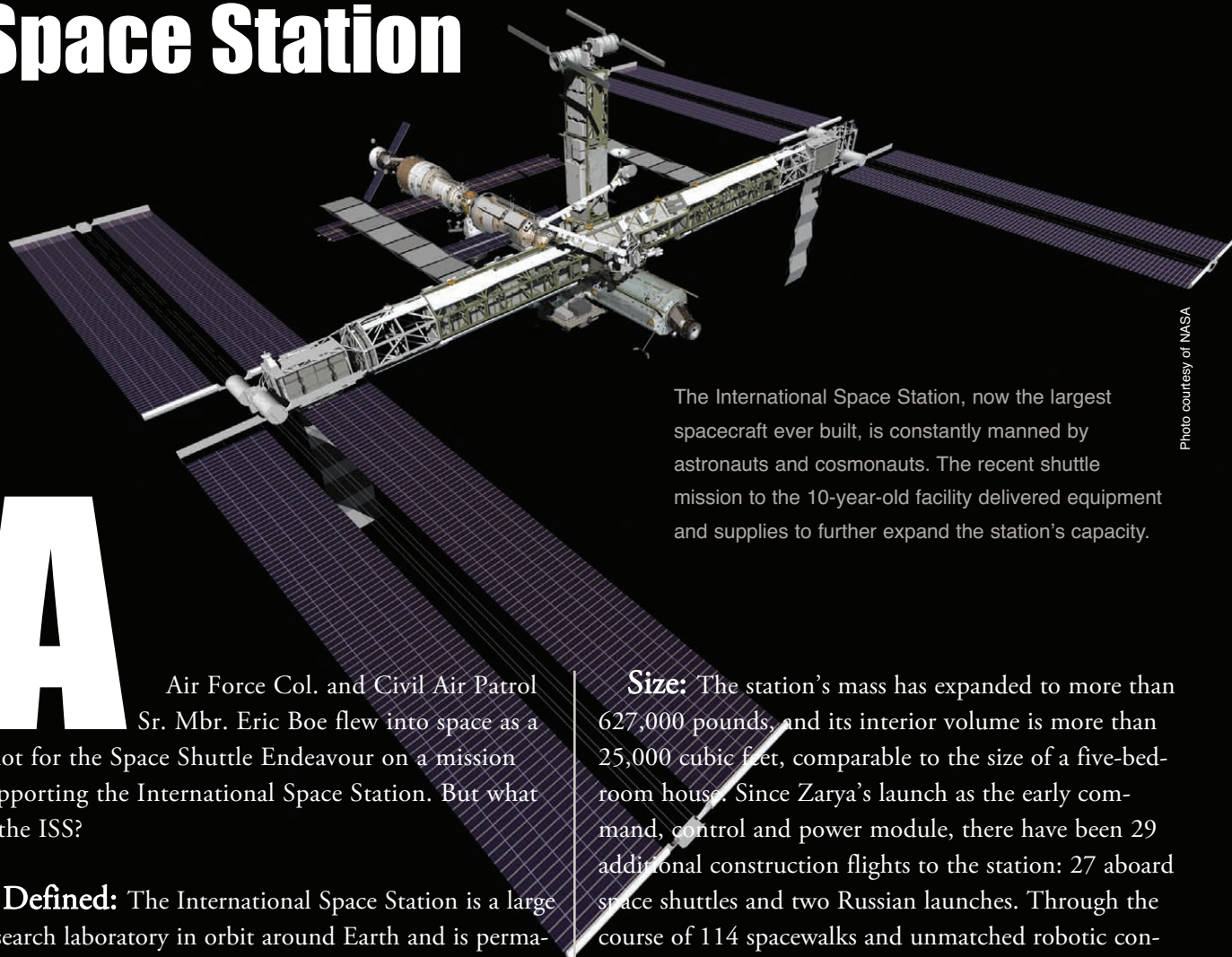


Photo courtesy of NASA

The International Space Station, now the largest spacecraft ever built, is constantly manned by astronauts and cosmonauts. The recent shuttle mission to the 10-year-old facility delivered equipment and supplies to further expand the station's capacity.

# A

Air Force Col. and Civil Air Patrol Sr. Mbr. Eric Boe flew into space as a pilot for the Space Shuttle Endeavour on a mission supporting the International Space Station. But what is the ISS?

**Defined:** The International Space Station is a large research laboratory in orbit around Earth and is permanently manned by teams of astronauts and cosmonauts. It turned 10 years old on Nov. 20, 2008. Now the largest spacecraft ever built, the orbital assembly of the space station began with the launch from Kazakhstan of its first bus-sized component, Zarya, on Nov. 20, 1998.

**Team effort:** The International Space Station is a venture of international cooperation among NASA, the Russian Federal Space Agency, the Canadian Space Agency, Japan Aerospace Exploration Agency, or JAXA, and 11 members of the European Space Agency, or ESA: Belgium, Denmark, France, Germany, Italy, the Netherlands, Norway, Spain, Sweden, Switzerland and the United Kingdom.

**Size:** The station's mass has expanded to more than 627,000 pounds, and its interior volume is more than 25,000 cubic feet, comparable to the size of a five-bedroom house. Since Zarya's launch as the early command, control and power module, there have been 29 additional construction flights to the station: 27 aboard space shuttles and two Russian launches. Through the course of 114 spacewalks and unmatched robotic construction in space, the station's truss structure has grown to 291 feet. Its solar arrays now span 28,800 square feet, large enough to cover six basketball courts.

**Space dining:** Crews have eaten some 19,000 meals aboard the station since the first crew took up residence in 2000.

**Science:** The International Space Station hosts 19 research facilities — nine sponsored by NASA, eight by ESA and two by JAXA. Cooperation among international teams of humans and robots is expected to become a mainstay of space exploration throughout the solar system. ▲



# HOW TO BECOME AN ASTRONAUT

Boe pauses for a photo while occupying the pilot's station on the flight deck of Space Shuttle Endeavour during flight day one activities.

Background: the launch pad was lit by a picturesque full moon.



Photo courtesy of NASA

**B**ecoming a shuttle pilot requires fast-jet experience, almost always achieved through a military flying career, and slots are few. Many more people choose to become shuttle mission specialists, who perform on-board experiments, make spacewalks and more. Becoming a mission specialist still requires much preparation, experience and dedication. The following summarizes requirements and tips for aspiring astronauts:

- If you aren't a U.S. citizen, become one; that is a must. After that, the crucial thing to remember is that the demand for such jobs vastly exceeds the supply. NASA's problem is not finding qualified people but thinning the lineup down to a manageable length. It is not enough to be qualified; you must avoid being disqualified for any reason, many of them in principle quite irrelevant to the job.
- Get a Ph.D. Specialize in something that involves getting your hands dirty with equipment, not just paper and pencil. Forget computer programming entirely; it will be done from the ground for the foreseeable future. Degree(s) in one field plus work experience in another seems to be a frequent winner.
- Be in good physical condition with good eyesight. (DO NOT get a radial keratotomy or similar sur-

gery to improve your vision; nobody knows how sudden pressure changes would affect eyes following this procedure, and long-term effects are poorly understood. For that matter, avoid any other significant medical unknowns.) If you can pass a jet-pilot physical, you should be OK; if you can't, your chances are poor.

- Practice public speaking and be conservative and conformist in appearance and actions; you've got a tough selling job ahead, trying to convince a cautious, conservative selection committee that you are better than hundreds of other applicants. The image you want is that of a squeaky-clean, workaholic yuppie. Remember also that you will need a security clearance at some point. Keep your nose clean.
- Get a pilot's license and make flying your No. 1 hobby; experienced pilots are known to be favored even for nonpilot jobs. Work for NASA; of 45 astronauts selected between 1984 and 1988, 43 were military or NASA employees. If you apply from outside NASA and miss but are offered a job at NASA, TAKE IT.
- Keep trying. Many astronauts didn't make it the first time. ▲

Source: <http://www.ksc.nasa.gov/facts/faq12.html>

Background photo by Brig. Gen. S. Hallock du Pont Jr., National Commander's Reserve Unit



# Space Travel by the Numbers



Photo courtesy of NASA

Members of the STS-126 Orbit 1 flight control team pose for a photo in the space shuttle flight control room in Mission Control Center at NASA's Johnson Space Center.

**7, 24, 365:** Days a week, hours a day and days a year that the Mission Control Center in Houston has someone on the job, assisting both shuttle missions and the International Space Station.

**90:** Minutes between sunrises aboard an orbiting space shuttle or the International Space Station.

**More than 200:** Miles, the height above the Earth astronauts are during spacewalks.

**803, 9, 39:** Days, hours and minutes spent in space by Sergei K. Krikalev, the human who has spent the longest cumulative time there.

**More than 1,000:** Number of approaches pilots fly in a modified Gulfstream aircraft before

being allowed to fly the shuttle.

**More than 6,000:** Temperature, at degrees Fahrenheit, reached inside the shuttle's main engines and solid rockets.

**17,500:** Speed, at mph, the shuttle attains 8½ minutes after launch.

**6.2 million:** Gallons of water held by the Neutral Buoyancy Laboratory — the world's largest swimming pool — at Johnson Space Center in Houston. Here, astronauts train for the weightlessness of space.

**6.6 million:** Miles flown by Space Shuttle Endeavour during Mission STS-126 in November 2008. ▲

# The **Necessities** of Life in Space

**S**pace isn't exactly the most hospitable place to be: no air, zero gravity, a sunrise every 90 minutes and temperature extremes. It's a challenge humankind has faced since the first space travelers went into orbit nearly 50 years ago. As humans have spent more time in space, they have developed ways to make themselves at home there.

## Food

One of the essential needs — the need to eat — requires creativity and problem-solving in zero gravity. It also requires planning to make sure space shuttle astronauts have enough food stowed for their two-week journey and reserves in case the shuttle's landing is delayed.

As a result, astronaut menus are planned in full for the entire flight. Space travelers attend a food tasting session months beforehand to help fill out their menus. But astronauts can't just pick out their favorite foods in space — no gorging on junk food is allowed. Their personal menus are approved by a dietitian to ensure they are nutritious enough for a busy workday.



Photo courtesy of NASA

Eric Boe participates in a food tasting session in the Flight Projects Division Laboratory at Johnson Space Center.

There is no dishwasher or kitchen sink. Therefore, food containers are disposable, and eating utensils and trays are cleaned using moist sanitizing towelettes.

Food aboard the shuttle is prepared in the galley, a modular unit that heats and rehydrates food and beverages.

cloths, one for washing and one for rinsing, and a rinseless shampoo. Water and soapsuds stick to the skin in weightless conditions, and excess water is suctioned into a wastewater tank. Toothpaste can be either swallowed or sucked out.

## Lavatory

The toilet is composed of a toilet bowl and urine funnel. To use the toilet, astronauts must employ leg restraints and thigh bars. The toilet works like a vacuum cleaner with fans that suck air and waste into the commode. ▲

## Sleeping

Of course, a typical bed is out of the question because there's no gravity to hold it or the sleeper down. To keep from floating around and bumping into things while asleep, an astronaut sleeps in a compartment tethered to the wall of the craft, like a cocoon in which he zips himself. The crew typically gets eight hours of sleep time after a 16-hour mission day.

## Hygiene

Astronauts keep themselves clean in space with the use of special soap. They take sponge baths daily, using two wash-

## Boe's Thanksgiving Day Menus

### Meal A

Oatmeal with brown sugar (rehydratable)  
Dried peaches (intermediate moisture)  
Blueberry-raspberry yogurt (thermostabilized)  
Clif bar, cool mint chocolate (natural form)  
Metamucil wafers, cinnamon (natural form)  
Orange-mango drink (beverage)  
Kona coffee with cream and sugar (beverage)

### Meal B

Crawfish etouffee (thermostabilized)  
Peanut butter (fresh food)  
Grape jelly (thermostabilized)  
Two tortillas (fresh food)  
Trail mix (intermediate moisture)  
Banana pudding (thermostabilized)  
Two lemonades (beverage)

### Meal C (Thanksgiving meal)

Smoked turkey (irradiated)  
Candied yams (thermostabilized)  
Green beans and mushrooms (rehydratable)  
Cornbread dressing (fresh food)  
Cranapple dessert (thermostabilized)  
Tea with sugar (beverage)