

BACK TO MARS: NASA SCOUTS TWO NEW LOCATIONS

AIR & SPACE

Smithsonian

JANUARY 2004



INSIDE

A Preview of
Flight in 2103—
The Next
100 Years

MORE MUSEUM

THE STEVEN F. UDVAR-HAZY CENTER
OPENS—WITH MORE SPACE (AND AIR)!

Writing Sample
Kathleen Hanser

\$3.99 U.S./\$4.99 Canada



The National Air and Space Museum's Steven F. Udvar-Hazy Center

More to see, more to do, more to learn

The Smithsonian Institution first started collecting items related to flight in 1876, when the Chinese Imperial Commission donated a small selection of kites. Now, 127 years later, the National Air and Space Museum holds in trust 325 aircraft, 30,000 aviation artifacts, 9,000 space artifacts, 4,252 pieces of aviation art, 1.75 million aviation and space history images, 44,000 reference books, over 300,000 photographs of the planets and their satellites, and one genuine Space Shuttle.

It's no wonder that the National Air and Space Museum, which has been jokingly called the "Air and No Space Museum," is bursting at the seams. "We have the largest and most complete collection in the world, but the public has been deprived of its full benefit," said Gen. John R. "Jack" Dailey, director of the National Air and Space Museum. "To comprehensively explore the history, science and technology of flight, it takes a lot more room than we could ever have on the Mall."

The idea of building an annex to the world's most visited museum had been tossed around for decades. But lack of funding always held things up—until now. On December 15, the National Air and Space Museum ushers in a new era when its spectacular new companion facility, the Steven F. Udvar-Hazy Center, opens its doors to the public.

The Future Takes off from Here

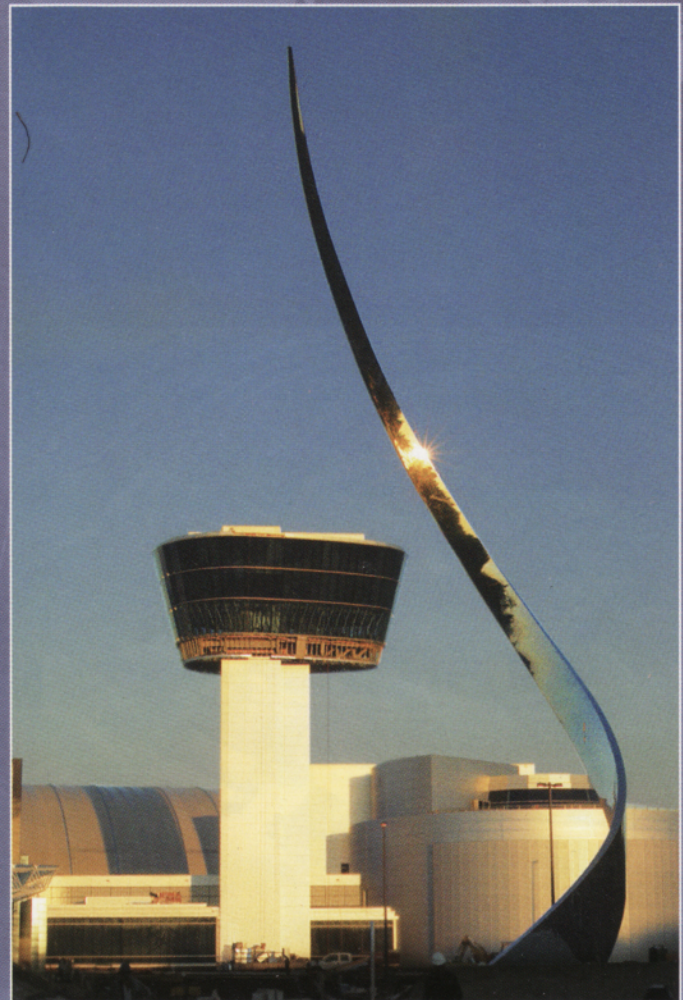
"This is the perfect way to launch the Smithsonian into the twenty-first century," said Lawrence M. Small, secretary of the Smithsonian Institution.

Located at the southeastern corner of Washington Dulles International Airport in northern Virginia, the Udvar-Hazy Center provides enough space to display artifacts that have been in storage or on loan for decades, plus those too large to display at the flagship building in Washington.

The aviation hangar is reminiscent of the gigantic hangars used in the past to house Zeppelins. Three football fields long and ten stories high, it is large enough for nearly 200 aircraft

With the opening of the Udvar-Hazy Center, the National Air and Space Museum becomes the largest museum of its kind in the world.

and hundreds of small aviation artifacts, with ceiling arches capable of holding 20,000 lbs. (9,000 kilograms). "We like to think of it as the Nation's Hangar," Dailey said.



Sunset over the Udvar-Hazy Center. The Donald D. Engen Observation Tower and the sculpture *Ascent* are in the foreground.

A second hangar houses the Space Shuttle *Enterprise* and will be home to 135 other space treasures that ultimately will be displayed there. In addition, there is a soaring 164-foot observation tower with views of all the runways at Dulles; an IMAX® theater; state-of-the-art education facilities; and, eventually, a restoration hangar and archive facilities.

All told, the Udvar-Hazy Center is approximately 760,057 square feet (70,611 square meters) in size, with plenty of room for expansion as the air and space advances of the twenty-first century are added to

Although the move-in is not anywhere near complete, upon opening, the Udvar-Hazy Center will have more aircraft on display than the museum on the Mall.

the collection. "A more important number to consider is 40 million cubic feet, because that means we have an unbelievable amount of volume to make use of," Dailey said. "We are using that volume to hang airplanes from the ceiling."

The new building is an attraction in itself. Besides being huge, it offers the latest in twenty-first century design concepts. Bill Hellmuth, architect, said his principal goal was to create a building as interesting as the artifacts themselves. The building looks and feels as if it belongs at an air terminal. The entrance is designed to look like an arrival and departure area, the main section like an airplane fuselage.



Interior view of the Udvar-Hazy Center, July 2003: Many of the artifacts are wrapped in plastic for protection before opening day.

Another goal of the design was to allow people to experience the relationships of scale that are inherent in displaying artifacts of this size. "I think people will enjoy this experience because it is something they're not accustomed to seeing every day," Hellmuth said.

Yet another special aspect of the design is a lack of exhibit galleries like you see at most other museums. Instead, imagine a huge, unobstructed space with aircraft displayed on three levels. Larger aircraft rest on the floor, where you can walk among them. Smaller aircraft hang from the steel trusses, giving the appearance of a sky full of aircraft flying in all directions. Forty-foot-high skywalks bring you nose-to-nose with the "flying" machines and offer impressive panoramic views of the entire hangar.

Seeing the Udvar-Hazy Center for the first time is a jaw-

dropping experience. "Whenever I bring people here, they just stand there in awe of the place," said Lin Ezell, project manager for the facility. "The most-often-used words I hear are, 'Awesome!' and 'Wow!'"

The aviation hangar is organized with military aircraft on the north side and civil aircraft on the south. Visitors enter onto the second floor near the center of the building. Straight ahead they see the dramatic and familiar lines of the Space Shuttle *Enterprise* in the Space Hangar.

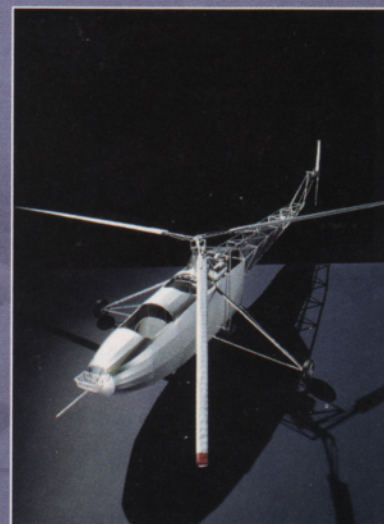
Ten thematic exhibit stations are placed throughout the center. The exhibit stations anchor aircraft or spacecraft according to these themes, and the hanging artifacts relate to the stations and other aircraft on the floor. The themes are:

- Business Aviation
- General Aviation
- Commercial Aviation
- Sport Aviation
- World War II Aviation
- Cold War Aviation
- Korean and Vietnam War Aircraft
- Modern Military Aviation
- Space Hangar Preview
- Pre-1920 Aviation
- Vertical Flight (2004)

Although "big" is the essence of the Udvar-Hazy Center, thousands of small artifacts finally have their day in the sun too. New display cases were designed by museum staff specifically for these collections. "I think visitors are really going to enjoy these smaller items going on display for the first time," said museum curator Dorothy Cochrane. "We have collections of aerial cameras, airplane machine guns, uniforms and Lindbergh memorabilia, to name a few."

Another "first" is having so many of the surviving gems of this nation's early rotorcraft heritage displayed in one place, most of which has been in storage for years. "Only 18 percent of our rotorcraft have been on display in the building on the National Mall," said Roger Connor, curator

Model of the Sikorsky VS-300 helicopter.



in the Aeronautics Division. The collection contains many spectacular rotorcraft that have proven to be major milestones for the industry.

Because this is such a huge, complicated undertaking, the center will open in phases. The initial phase was timed to coincide with the centennial of the Wright brothers' first powered flight. This phase includes the opening of the aviation and space hangars, the observation tower, IMAX® theater, education center, museum store, and food court. Artifacts will continue to be moved into the center over the next few years, making it a new experience for visitors each time they visit. Although the space hangar is complete, it will not officially open until mid-2004. In the meantime, visitors can see the *Enterprise* from the aviation hangar, as museum staff clean the craft and prepare it for display.



A restoration specialist covers the de Havilland Super Chipmunk in plastic at the Udvar-Hazy Center.

a unique way," Dailey said with pride. A few of the artifacts on display at the Udvar-Hazy Center are:

The de Havilland Super Chipmunk

The de Havilland Super Chipmunk was originally designed as a post-World War II primary trainer. Among the many pilots who flew the Chipmunk for pleasure was veteran aerobatic and movie pilot Art Scholl. He thrilled audiences flying his modified Chipmunks at air shows around the country through the 1970s and early 1980s. He worked on such movies as *Top Gun* and *The Great Waldo Pepper*, plus the TV series "Baa Baa Black Sheep." His cameras have also been donated to the museum and will be exhibited in the aerial-camera case.

Subsequent phases, dependent on funding, include the restoration hangar, object processing and study collection facilities, archives, conservation labs, and support buildings. "We are really anxious to get the restoration hangar up and running," said Ezell. "It will let people see how we preserve and restore our artifacts, putting what is usually a behind-the-scenes activity in full view of the public."

More to See

"Nowhere will you see a collection as complete as this, and displayed in such



The Curtiss P-40 Warhawk suspended from the trusses of the Udvar-Hazy aviation hangar.

How Did They Do That?

Q: How did you move all these airplanes?

A: First the aircraft were cleaned, inspected and disassembled. Special cradles were built to support the fuselage sections. For the larger aircraft, a forklift positioned the cradle and airplane high enough for a flatbed truck to be backed under them. Smaller airplanes were loaded into big rigs. Once the cradled fuselage and other pieces were on board, heavy chains were used to secure them in place, and the aircraft were trucked on the highways between Suitland, Maryland, and Chantilly, Virginia, usually in the very early, dark hours of the morning. "It's much more complicated and time-consuming than this, but that's the process in a nutshell," said Al Bachmeier, museum specialist. The Collections staff estimates they will spend 15,599 hours to pack and move the artifacts just for Stage One (opening day).

Q: How did you figure out where to put everything?

A: First, a variety of reference materials was used to get enough information to make scale drawings of each artifact. With these, William "Jake" Jacobs from the Exhibits Division was able to create computer drawing files for the artifacts. These drawings were combined with building drawings provided by the architect, using AutoCAD® (Automated Computer-Aided Design) software. The drawing files from AutoCAD® were used to drive a router that cut out scaled two-dimensional models from 1/8-inch-thick plastic. These cutouts were arranged by curators in a scale model of the Udvar-Hazy Center to get a three-dimensional view of how everything should fit together. Thus, physical and computer models were available for the movers and riggers come move-in day.

Estimates call for three million visitors a year at the Udvar-Hazy Center in addition to the over nine million who visit the Mall site.

The building on the Mall was America's gift for the nation's bicentennial, and the Udvar-Hazy Center is America's gift for the centennial of flight.

McDonnell F-4S Phantom II

Some aircraft are remembered for the large number produced, others for their length of time in service, and others for their ability to perform their mission. The McDonnell F-4S Phantom II is known to be one of the leaders in all three categories. In 1968 the Navy chose the F-4J for its Blue Angels team and in 1969 the U.S. Air Force chose the F-4E for its Thunderbirds team. The United Kingdom, Iran, South Korea, Spain, Australia, Israel, Japan, Greece, Turkey, and Germany bought McDonnell F-4s in large numbers.

Gemini VII

NASA launched Gemini VII on December 4, 1965, the third in a series of long-duration missions that would demonstrate capabilities necessary to reach the Moon in Project Apollo. Frank Borman served as command pilot and Jim Lovell as the pilot. Borman and Lovell not only studied the long-term effects of spaceflight but also rendezvoused in Earth orbit with Gemini VI, another skill critical to completing

Apollo. Altogether Gemini VII remained in orbit for 14 days, completing 220 orbits.

U. S. Army as a derivative of the original designation HU-1A: Helicopter, Utility, model 1A. For a time, the Huey was one of the most recognizable aircraft in history. People knew it not just on sight but by sound. They heard the unmistakable *whop-whop-whop* of the main rotor blade long before they saw the Huey.

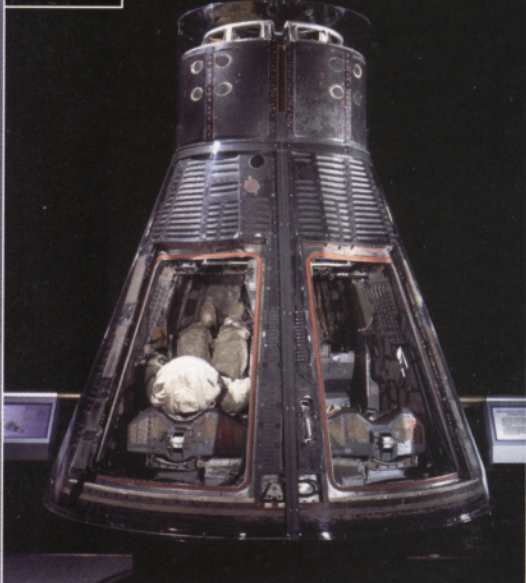
You can read about more aircraft destined for the Udvar-Hazy Center on our



Junkers Ju 52/3m

The Junkers Ju 52/3m carried up to 17 passengers, or about three tons of freight, and cruised at about 150 mph. It could take off from or land on almost any reasonably sized field, even a football field.

Gemini VII



The Gemini VII capsule. This mission was the longest U.S. spaceflight until Skylab.

Junkers Ju 52/3m (CASA 352L)

This tri-motor passenger plane was designed in Germany and built in the 1930s. It became one of the best-known European transport aircraft in history, and the one produced in the greatest numbers. The German flag carrier, Deutsche Luft Hansa (D.L.H.), had more than 200 of them, and it was so loved by its pilots they affectionately called it "Tante Ju," or "Aunt Ju."

Bell UH-1H Iroquois

What the jeep was to Americans during World War II, so was the Huey to those who fought in Vietnam. All branches of the U. S. military operated them, and they ranged to every corner of South Vietnam and into Cambodia and Laos. The term "Huey" originated in the

map on page 41. For complete information on all the artifacts going into the center, please visit: <http://www.nasm.si.edu/museum/udvarhazy/artifacts.cfm>

More to Do

Bring your binoculars and watch airliners from all over the globe take off and land at Dulles Airport.

Try your hand at landing aircraft at the interactive air traffic control mock-up.

Strap yourself into a flight simulator and pilot through a twisting 360-degree aileron roll or pull back on the joystick to complete an upside-down loop.

Experience the thrill of a large-screen IMAX® movie.

Take a guided tour.

Shop in the museum store.

Take time out for lunch; food is available on the first and second levels.

XV-15



The Bell Tiltrotor XV-15 makes its final landing at the Udvar-Hazy Center.

Then—take the shuttle bus to the Mall and see even more of the greatest icons of aviation and space.

More to Learn

With the museum expansion, the National Air and Space Museum will have many more opportunities to complete the “educate and inspire” portions of its mission. From the beginning of the design process, the education facilities

these brand-new, state-of-the-art facilities.

One of the most exciting new developments is the “Teacher-in-Residence” program. Three teachers, from Virginia’s Fairfax and Loudoun School Districts and the Potomac School, have been loaned to the Udvar-Hazy Center full-time for an entire year. These teachers will assist with the development and presentation of school pro-

and the center’s collections. The Teacher-in-Residence program provides needed staff and curriculum support to the Udvar-Hazy Center, while the schools gain a teaching resource well versed in the resources of the National Air and Space Museum. Their respective school districts have generously agreed to pay the salaries of the teachers while they are in residence.

But the center’s educational reach goes far beyond Virginia. The new center has three classrooms, two traditional and one laboratory, with full multimedia capabilities. Students from all over the country can make virtual visits to the museum, participating in distance learning through their school’s satellite hook-up.

Tours for student groups will be first-rate. More than 500 people applied to be volunteer docents leading these tours! With such a large pool of applicants to choose from, and the intensive training they were given, the center’s docent team is one of the finest anywhere.

The center is named after Steven F. Udvar-Hazy, President and CEO of International Lease Finance Corp., who launched the project with a donation of \$60 million and later pledged an additional \$5 million.

at the Udvar-Hazy Center were given special attention, and students all over the country will be able to benefit from

programming based on the Virginia State Standards of Learning and the collections of the National Air and Space Museum. They will create teaching plans, building a bridge between the school curriculum

The Interactive Discovery Stations so popular at the flagship building on the Mall will be available at Udvar-Hazy as well. The stations in place so far include:

- Principles of Flight
- Inventing Flight
- Air Transportation Past, Present and Future
- Living and Working in Space

The Udvar-Hazy Center features other interactive activities, such as the Great Paper Airplane Contest. It also hosts numerous special events throughout the year. Please visit the National Air and Space Museum’s web site for a schedule and other information about educational activities available:

<http://www.nasm.si.edu/education/overview.cfm>



Boeing 367-80

The Boeing 367-80 (Dash 80) is one of the aircraft appearing on an Education poster designed to illustrate the way wings work. Each aircraft on the poster was chosen for its wing shape and design.

Some highlights and a map of the National Air and



DAVE PENLAND

The B-29 Superfortress *Enola Gay*: Fully restored and in one piece for the first time in nearly 40 years. It dropped the first atomic bomb during World War II.



DAVE PENLAND

Boeing 307 Stratoliner: First commercial airliner to use pressurization, a technology that allowed it to fly over weather. Designed in the 1930s.



DAVE PENLAND

Republic P-47D Thunderbolt: Nicknamed the "Jug," the heaviest single-engine fighter of World War II. It was produced in greater numbers than any other U.S. fighter.



ERIC LONG

Space Shuttle *Enterprise*: From 1977 through 1979, NASA used the *Enterprise*, the first shuttle, for approach and landing test flights in the atmosphere as well as vibration tests and launch pad fit checks on the ground.



DAVE PENLAND

Northrop N-1M Flying Wing: The first flying wing airplane with cockpit, engine, and fuselage integrated in a basic airfoil envelope.



ERIC LONG

Lockheed SR-71 Blackbird: Fastest jet in the world—ever. On its final flight, in 1990, it flew from Los Angeles to Washington, D.C., in 1 hour, 4 minutes, and 20 seconds, averaging 2,124 mph (3,418 kph).

BAC/Aerospatiale Concorde: The only Western supersonic jet ever put into service. Began flying commercially in 1976. Air France and British Airways were the only airlines to fly them.



CAROLYN RUSSO

Space Museum's new Steven F. Udvar-Hazy Center



Facts for Your Visit



An aerial view of the Udvar-Hazy Center taken before the facility was completed.

ERIC LONG

The National Air and Space Museum's
Steven F. Udvar-Hazy Center
Air and Space Museum Parkway
Chantilly, Virginia
(202) 357-2700, (202) 357-1729 (TTY)
www.nasm.si.edu/museum/udvarhazy/

Round-trip shuttle bus service is available between the building on the National Mall and the Udvar-Hazy Center. The cost is \$7 per person.

Parking is available for 2,000 cars at \$12.00 per day.

Welcome Center: Just on the right inside the front entrance, on level two.

Tours: Walk-in highlights tours are offered daily at 10:30 a.m. and 1:00 p.m.

Live demonstrations are offered at various times throughout the center.

Photography: Hand-held and home video cameras are permitted; tripods are not.

Where to eat: Food service is located on levels one and two of the center.

Museum Store: The Museum Store, offering a variety of flight-related merchandise, is located on level two.

IMAX® Theater: Daily showings of large-format films are presented on a giant screen. Tickets can be purchased online at www.smithsonian.org/IMAX®

To make your visit more enjoyable, please wear comfortable, rubber-sole shoes, as the floor is not carpeted.

Directions to the Udvar-Hazy Center:

From Washington, D.C., and points south: I-66 West to Route 28 North (Exit 53B): Travel on Route 28 North for 5.3 miles. Exit at Air and Space Museum Parkway and follow the signs to the Udvar-Hazy Center.

From Washington, D.C., and points north: I-495 South (Capital Beltway) to the Dulles Toll Road West (Route 267). Exit the toll

road at Route 28 South (Exit 9) and travel south 3.5 miles. Exit at Air and Space Museum Parkway and follow the signs to the Udvar-Hazy Center.

From the west: Take the Dulles Greenway to Route 28. Exit at Air and Space Museum Parkway and follow the signs to the Udvar-Hazy Center.

National Mall: The National Air and Space Museum
6th St. and Independence Ave., SW
Washington, DC
(202) 357-2700, (202) 357-1729 (TTY)
Nearest Metro Stop: L'Enfant Plaza
www.nasm.si.edu

Help Support the Udvar-Hazy Center and Be a Part of History Too

Place your name on the Wall of Honor, next to some of history's most famous air and space explorers, like the Wright brothers, Charles Lindbergh, Amelia Earhart, and John Glenn. The Wall of Honor is a permanent memorial to those who have contributed to aviation and space history, or those with a passion for flight. To put a name on the Wall of Honor, follow the registration instructions on the museum's web site:

www.nasm.si.edu/wallofhonor

or call: 202-633-2606

or e-mail: wallofhonor@nasm.si.edu

Minimum donation is \$100 and is tax deductible.