

# Life @ NASA

5

YEARS



**MISSION GUIDE**

# *Get ready to explore Life @ NASA*

This Mission Guide, commemorating NASA's participation in the September 2008 AARP conference, will help you chart a course through the exciting world of NASA research, science and technology. Now is your chance to find out about all the work that NASA does and its relevance to you, and have your questions answered directly by NASA representatives.

When you complete at least four of the activities in this book, return to the Mission Guide table to receive your NASA reward!

Ready to launch into Life @ NASA?

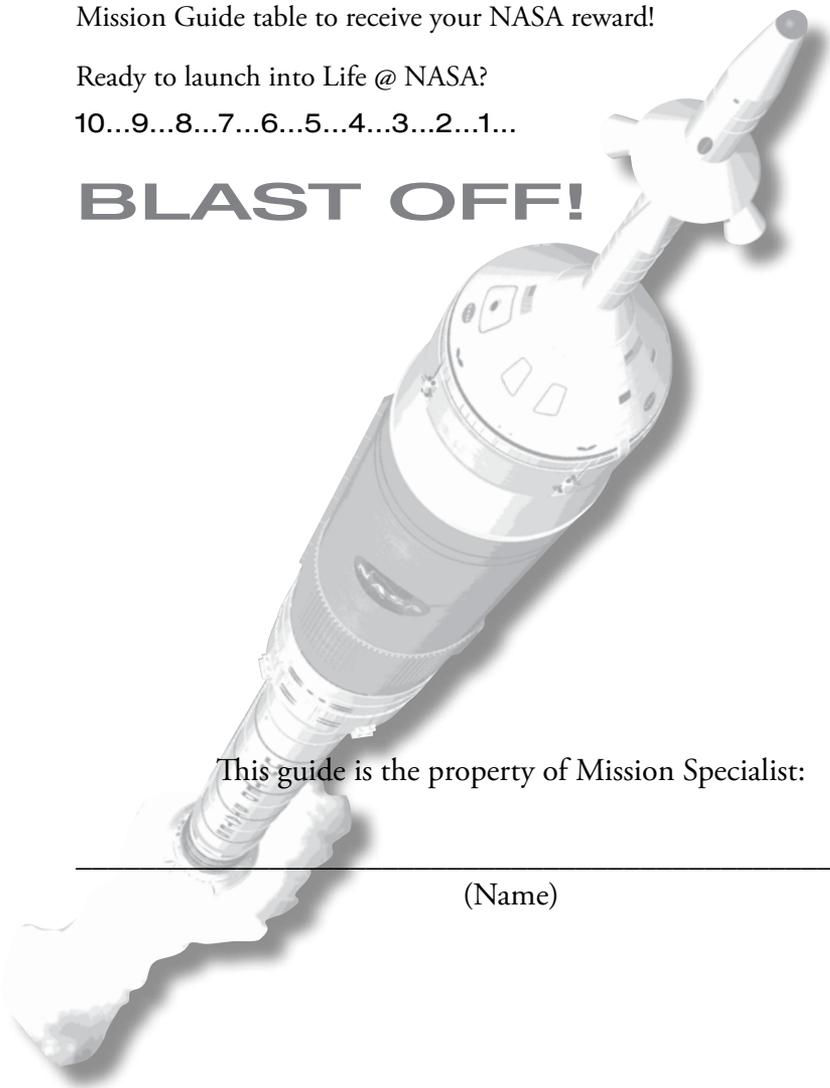
10...9...8...7...6...5...4...3...2...1...

## **BLAST OFF!**

This guide is the property of Mission Specialist:

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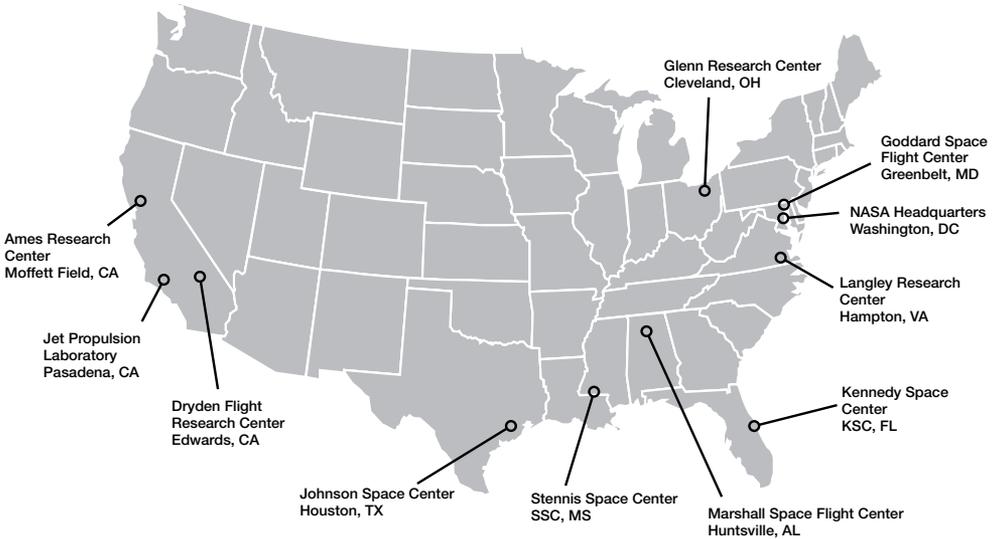
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## NASA Near You

Visit one of the NASA Centers around the country. Many have visitor centers that are open to the public.

While in Washington, D.C., don't forget that the Smithsonian Institution has two museums dedicated to aeronautics and space flight: the National Air and Space Museum on the National Mall and the Steven F. Udvar-Hazy Center in Chantilly, Virginia.



*NASA's web pages are a great way to explore NASA right from your home:*

- **NASA 50th Anniversary:** [www.nasa.gov/50th](http://www.nasa.gov/50th)
- **NASA Education:** [www.nasa.gov/education](http://www.nasa.gov/education)
- **NASA Improves Life on Earth:** [www.nasa.gov/topics/nasalife](http://www.nasa.gov/topics/nasalife)
- **NASA Spinoff:** [www.sti.nasa.gov/tto](http://www.sti.nasa.gov/tto)
- **NASA AARP:** [www.nasa.gov/50th/AARP](http://www.nasa.gov/50th/AARP)

## Where Were You?

**“One small step for a man, one giant leap for mankind”**

Neil Armstrong

You probably remember where you were and what you were doing on July 20, 1969, what many consider one of the most significant days in human history.

Flash back to the summer of 1969. It's a little over eight years since the flights of Gagarin and Shepard, followed quickly by President Kennedy's vision of putting a man on the Moon before the decade is out.

On the morning of July 16, Apollo 11 astronauts Neil Armstrong, Buzz Aldrin and Michael Collins sit atop a Saturn V at Launch Complex 39A at the Kennedy Space Center.

When the lunar module lands at 4:18 p.m. EDT, only 30 seconds of fuel remain. Armstrong radios “Houston, Tranquility Base here. The Eagle has landed.”

At 10:56 p.m. EDT Armstrong is ready to plant the first human foot on another world. With more than half a billion people watching on television, he climbs down the ladder and proclaims: “That's one small step for man, one giant leap for mankind.”

**Where were you? Go to the NASA video interview booth under the model of the Moon and record your memories, where they will be subsequently posted to the NASA 50th Web site at [www.nasa.gov/50th/AARP](http://www.nasa.gov/50th/AARP).**

The Lunar Reconnaissance Orbiter (LRO) is the first mission in NASA's planned return to the Moon. LRO is scheduled to launch in early 2009 to find safe landing sites, locate potential resources, characterize the radiation environment, and test new technology. Launching with LRO is the Lunar CRater Observation and Sensing Satellite (LCROSS).

The return to the Moon will enable the pursuit of scientific activities that address our fundamental questions about the history of Earth, the solar system and the universe—and about our place in them.

*[www.moon.msfc.nasa.gov](http://www.moon.msfc.nasa.gov)*

*Moon Facts*

*Choose from the list of words below to fill in the blanks; then use the first letter of each word to reveal the first human who set foot on the Moon, on July 20, 1969.*

NASA's      surface      age      moon      only  
 rock      Gravity      rocket      temperature

1. The \_\_\_\_\_ of the oldest Moon \_\_\_\_\_ collected is 4.5 billion years old.
2. The average distance of the \_\_\_\_\_ from Earth is 384,400 kilometers.
3. Only about 59 percent of the Moon's \_\_\_\_\_ is visible to us here on Earth.
4. The Moon's equatorial surface \_\_\_\_\_ during the day is about 127° C (260° F), and at night is -173° C (-280° F).
5. It takes 60 to 70 hrs flying time to get to the Moon by \_\_\_\_\_.
6. If you weigh 120 pounds, you would weigh \_\_\_\_\_ 20 pounds on the Moon.
7. The Lunar Reconnaissance Orbiter is \_\_\_\_\_ first mission in the plan to return to the Moon and then to travel to Mars and beyond.
8. \_\_\_\_\_ at the surface of the Moon is 1/6 that of the Earth.
9. The first human to step foot on the Moon was:

\_\_\_\_\_

Answers: 1. age, rock 2. Moon 3. surface 4. temperature 5. rocket 6. only 7. NASA's 8. Gravity 9. Armstrong

## *International Space Station*

Humans live and work 220 miles above Earth onboard our orbiting outpost, the International Space Station. Astronauts are pioneers doing research to make future missions to other planets possible. Did you know:

The Station orbits the planet every 90 minutes traveling 17,500 miles per hour.

The Station supports an international crew of three, and will expand to six in 2009.

We've been building Station for a decade, and will complete assembly in 2010—when we retire the Space Shuttle.

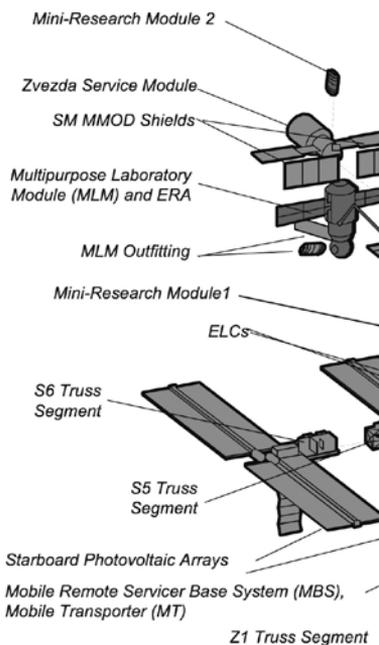
Fifteen different nations worked together to build this orbiting outpost.

The Station is a success story for green technology:

- The Sun powers the solar arrays.
- Energy is transported along the truss and stored for later use.
- Station systems recycle air, water, and waste for the crew.

When fully assembled, the Station will be the third brightest object in the sky, after the Sun and Moon. To find out when the Station will be visible from any given city, visit:

*[www.spaceflight.nasa.gov/realdatalightings](http://www.spaceflight.nasa.gov/realdatalightings)*

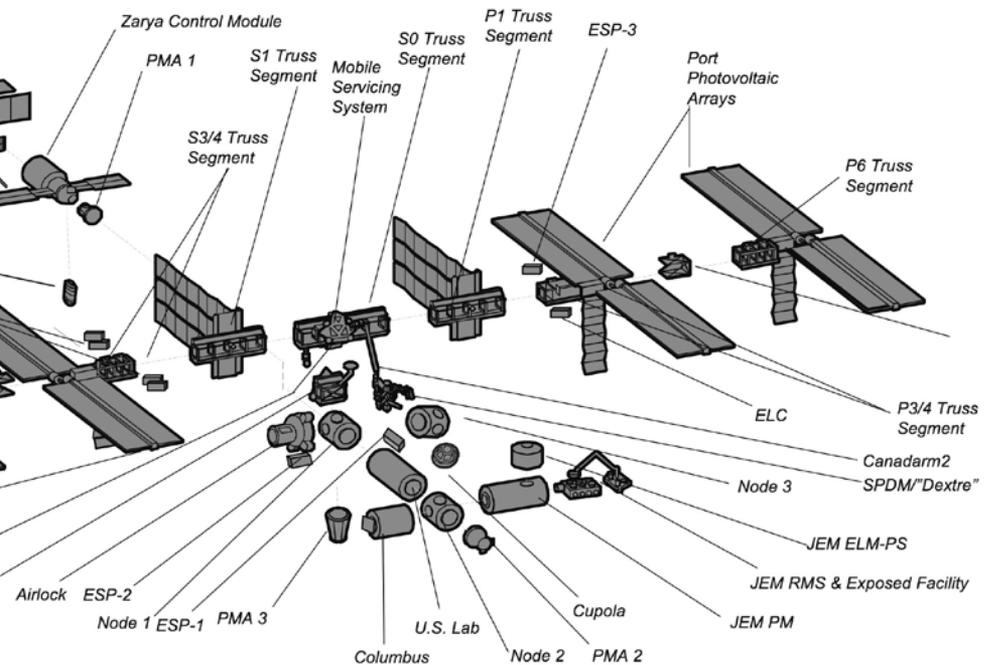


## *International Space Station*

Ask a NASA exhibitor to help identify the following Space Station elements:

- Solar (Photovoltaic) Array
- Destiny (U.S. Laboratory)
- Columbus (European Laboratory)
- Kibo (Japanese Experiment Module)

## ISS Configuration



## NASA @ Home and City

*Visit the NASA Home and City area of the NASA Exhibit to learn about everyday consumer products and services that were developed as a result of NASA research. Perhaps NASA's work is not so "far out" after all. Answer the following, true or false:*

1. The Doppler Velocimeter technology originally developed by NASA to measure airflow disturbances in wind and in flight was adapted to monitor smokestack plumes.

**TRUE**

**FALSE**

2. Diabetics need not be concerned with scheduling activities around peaking insulin levels with the use of the insulin infusion pump—utilizing NASA's space-driven microminiaturization techniques—which delivers insulin continuously at a preprogrammed, individually adjusted rate.

**TRUE**

**FALSE**

3. Video Image Stabilization and Registration (VISAR), a technology originally developed by NASA for analyzing satellite video, helped FBI agents analyze video footage of the deadly 1996 Olympic Summer Games bombing in Atlanta, Georgia.

**TRUE**

**FALSE**

## *NASA @ Home and City*

4. NASA developed freeze-dried foods because they are crunchier and because astronauts are really bad cooks.

**TRUE**

**FALSE**

5. NASA-sponsored doctors created a new type of electrocardiographic device for long-term use on astronauts, which was subsequently licensed for use in personal heart monitoring and home physical fitness use.

**TRUE**

**FALSE**

6. Even though NASA developed wireless headset technology, astronauts in space prefer to text each other on their cell phones.

**TRUE**

**FALSE**

7. A technology developed for use in plant growth experiments aboard the Space Shuttle has resulted in the creation of a device that removes ethylene and helps prevent spoilage and increases the shelf life of perishable foods.

**TRUE**

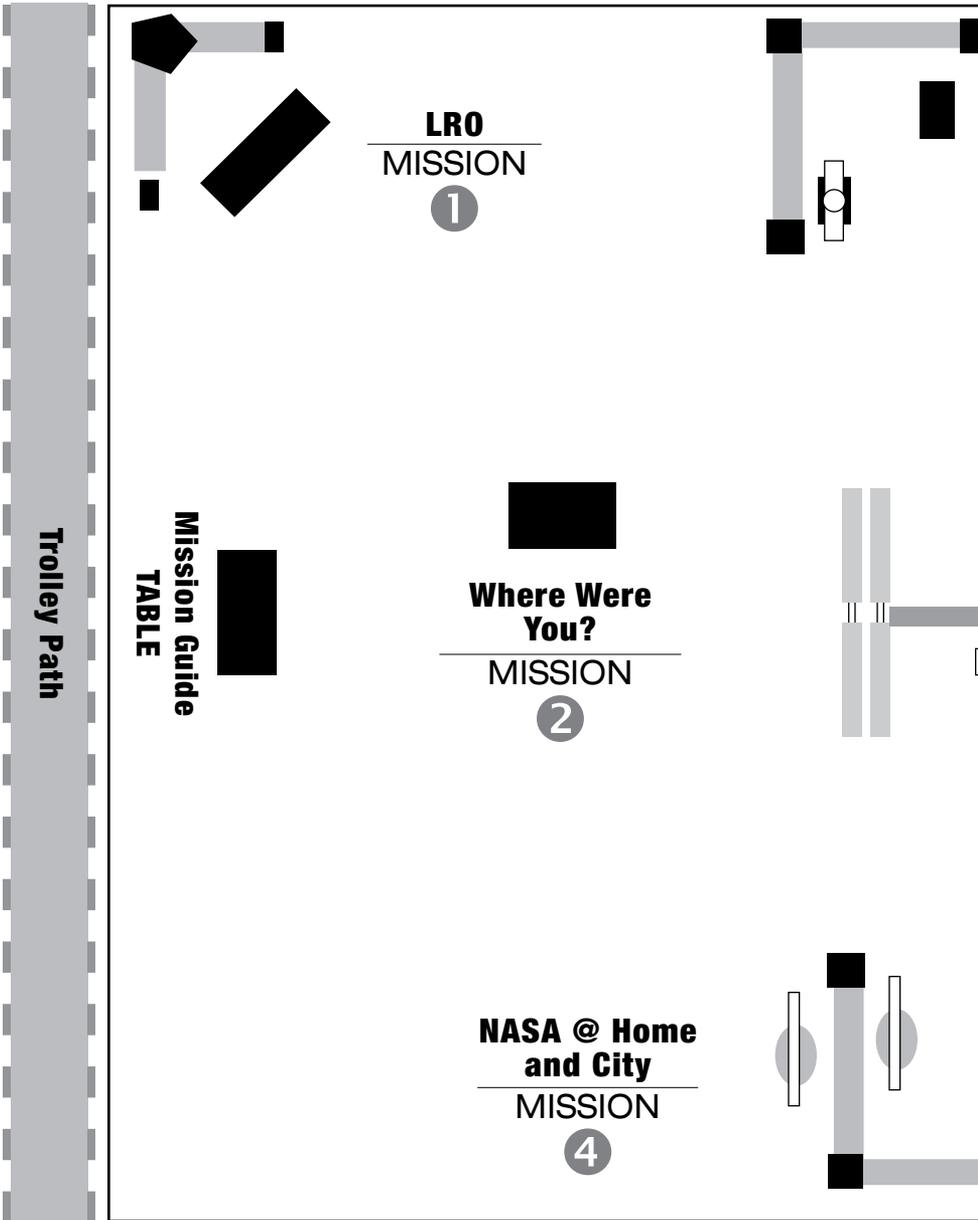
**FALSE**

*[www.nasa.gov/city](http://www.nasa.gov/city)*

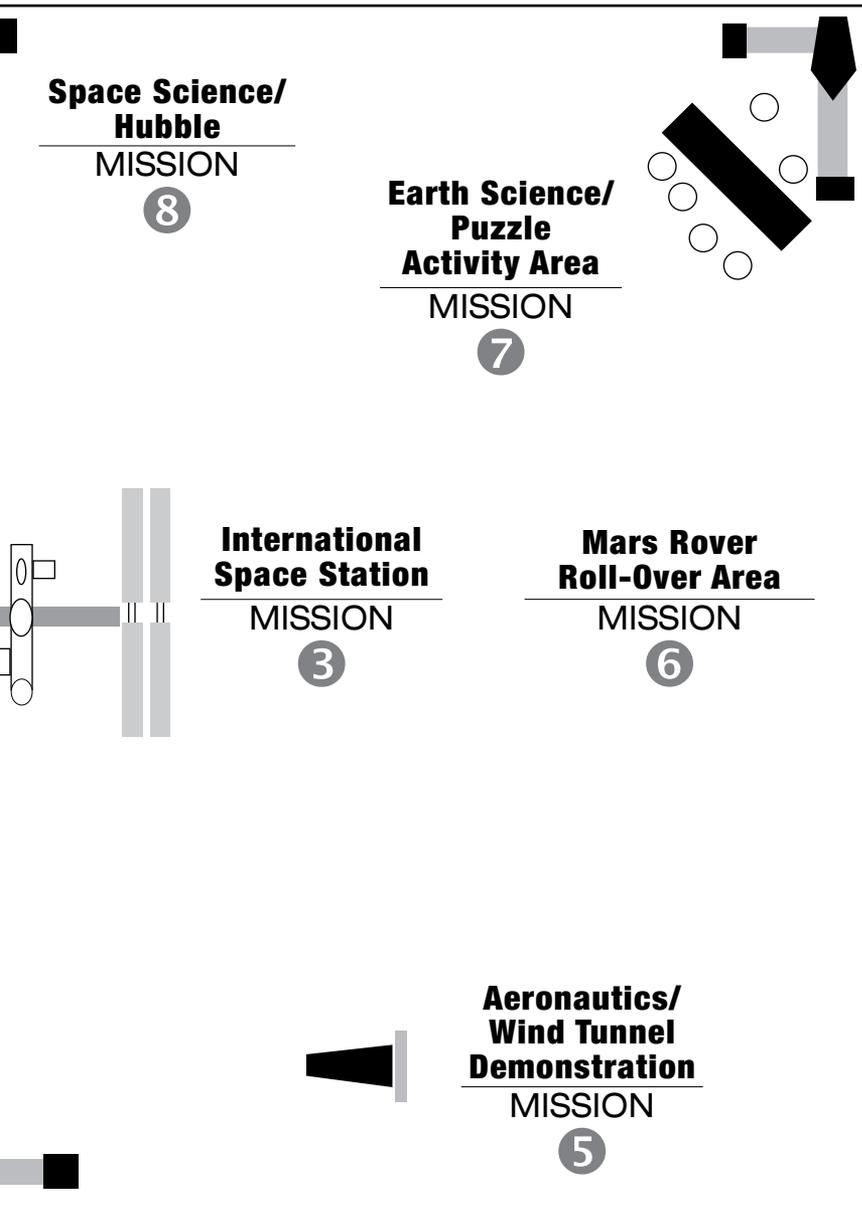
*[www.sti.nasa.gov/tto](http://www.sti.nasa.gov/tto)*

Answers: 1. True 2. True 3. True 4. False 5. True 6. False 7. True

# MISSION GUIDE—*Life @*



# NASA AARP Exhibit Area



*Aeronautics*

NASA's Future Air traffic management Concepts Evaluation Tool (FACET) is a flexible software tool that provides powerful simulation capabilities and can rapidly generate thousands of aircraft trajectories, enabling efficient planning of air traffic flows. FACET is capable of processing more than 15,000 aircraft on a single desktop or laptop computer. For the commercial airline passenger, this holds the promise of more frequent on-time departures and arrivals.

FACET has transitioned successfully from NASA laboratory theoretical use to national operational use. Technologies derived from FACET have been incorporated into the FAA's traffic management system, which is currently used by more than 500 air traffic managers at approximately 100 sites nationwide.

**Fifty Years of Aeronautics**

*Match the aeronautics event to the year.*

- |   |      |
|---|------|
| 1. First NASA X-15 research flight  | 1988 |
| 2. NASA teams with the Air Force and the FAA to begin testing of runway pavement grooving   | 2006 |
| 3. Ribbon-cutting for the National Transonic Facility (NTF), the first NASA wind tunnel large enough and equipped for scale model testing in actual flight conditions | 1983 |
| 4. Begin advanced technology program using textile composite materials on wing and fuselage structures  | 1959 |
| 5. Pathfinder Unmanned Aerial Vehicle (UAV) sets new altitude record for a solar-powered aircraft of 50,567 feet above Edwards Air Force Base, CA                     | 1995 |
| 6. Future Air traffic management Concepts Evaluation Tool (FACET) wins NASA software of the year award  | 1967 |

*[www.nasa.gov/topics/aeronautics](http://www.nasa.gov/topics/aeronautics)*

## Mars/Phoenix

Mars is a cold desert planet with no liquid water on its surface. But in the Martian arctic, water ice lurks just below ground level. Discoveries made by the Mars Odyssey Orbiter in 2002 show large amounts of subsurface water ice in the northern arctic plain.

The Phoenix lander targeted this circumpolar region using a robotic arm to dig through the protective topsoil layer to the water ice below and ultimately, to bring both soil and water ice to the lander platform for sophisticated scientific analysis.



Fill in the missing blanks in the Earth/Mars comparison chart below.

	Mars	Earth
1. Average Distance from the Sun	_____	93 million miles
2. Length of Year	687 Earth Days	_____
3. Average Temperature	_____	57° F
4. Gravity	0.375 that of Earth	2.66 times that of Mars
5. Number of moons	_____	1

*Here's your chance to feel what it's like to be rolled over by a NASA Mars rover—go to the Mars Mission Guide area of the NASA exhibit booth.*

*[nasascience.nasa.gov/planetary-science](http://nasascience.nasa.gov/planetary-science)*

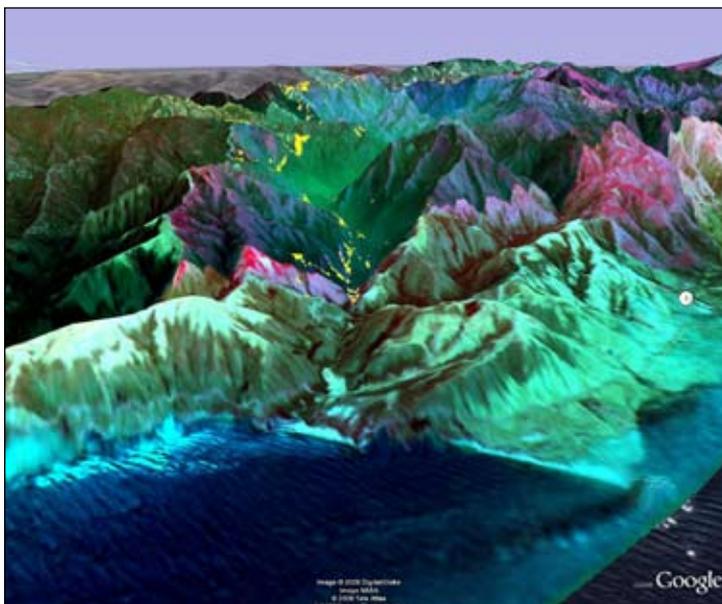
Answers: 1. 142 million miles 2. 365.25 days 3. -81° F 5. 2

## Earth Science

A remotely piloted aircraft carrying a NASA sensor flew over much of California in July 2008, gathering information to help fight more than 300 wildfires in the state. The flights by NASA's unmanned Ikhana aircraft used a sophisticated Autonomous Modular Scanner to detect temperature differences from less than one-half degree to approximately 1,000 degrees Fahrenheit. The scanner operates like a digital camera with specialized filters to detect light energy at visible, infrared, and thermal wavelengths.

*“ NASA’s emergency imaging gives us immediate information that we can use to manage fires, identify threats and deploy firefighting assets. I thank NASA for providing us with this important firefighting tool that will help us maximize attacks on the more than 300 active fires currently burning in California.”*

CA Governor Arnold Schwarzenegger



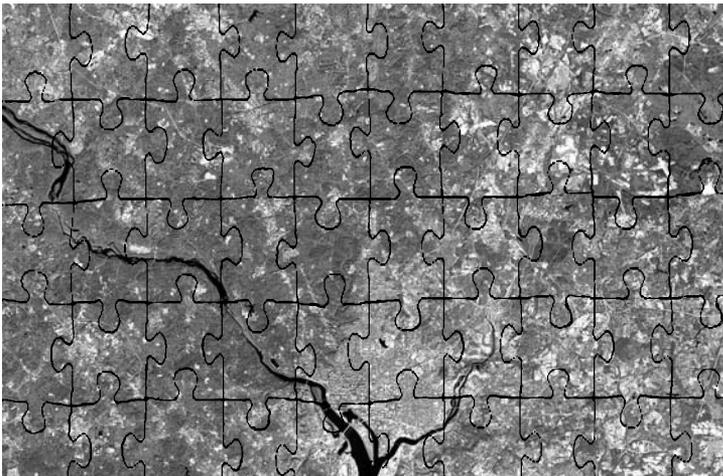
Ikhana image has been overlaid onto terrain data within Google Earth to provide additional information on the effects of terrain on fire behavior. (Photo credit: Google)

[www.nasa.gov/fires](http://www.nasa.gov/fires)

## *Earth Science*

NASA satellite sensors gather large amounts of image data every second. The satellite broadcasts the data back to Earth, and an Earth-based antenna receives the signal. From there, the data are sent to an operations center where the data are decoded and made into an image. Images can be made from light, heat, or any other type of electromagnetic energy. By carefully selecting the wavelengths that a satellite instrument measures, it is possible to study many features of Earth's surface or its atmosphere. Analyzing multiple images of the same area allows scientists to identify features and events—like urban versus rural areas, or fires—by combining what they learn from each image.

*Visit the Earth Sciences area of the NASA exhibit to learn how scientists collect image data to study natural features of Earth's surface by putting together a puzzle of a satellite image.*



*[nasascience.nasa.gov/earth-science](https://nasascience.nasa.gov/earth-science)  
[www.nasa.gov/topics/earth](https://www.nasa.gov/topics/earth)  
[earthobservatory.nasa.gov](https://earthobservatory.nasa.gov)*

## *Hubble Space Telescope*

The Hubble Space Telescope (HST) is a large, space-based observatory, which has revolutionized astronomy by providing unprecedented deep and clear views of the universe, ranging from our own solar system to extremely remote fledgling galaxies forming not long after the Big Bang 13.7 billion years ago. NASA is targeting early October 2008 for the launch of the fifth and final Space Shuttle servicing mission to the Hubble Space Telescope. Servicing Mission 4 (SM4) is the final Shuttle mission for the Hubble Space Telescope. Astronauts will bring new instruments to Hubble along with gyroscopes, batteries, and other components crucial for the telescope's continued success through the year 2013.

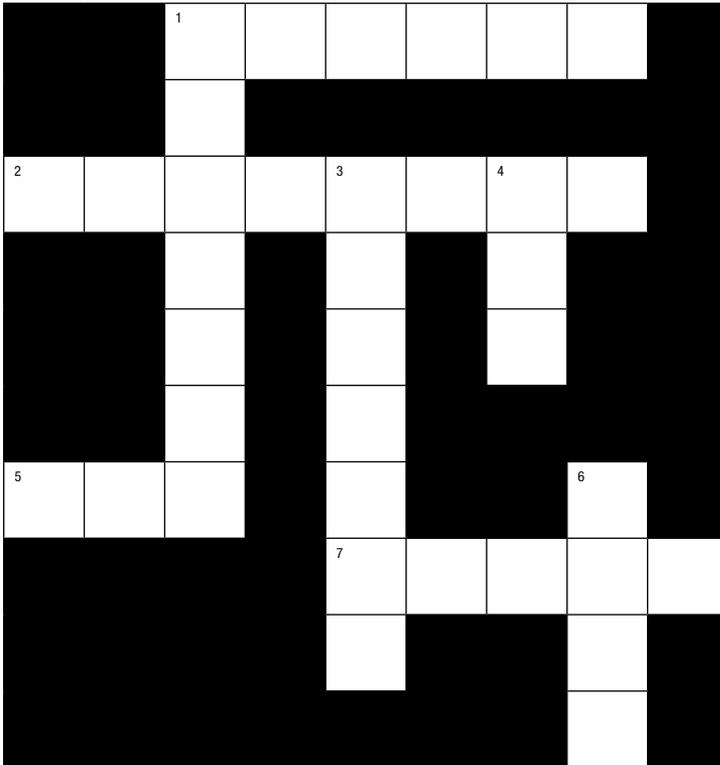
The STS-125 Hubble Servicing Mission crew and their hometowns are:

- Scott D. Altman (Pekin, Illinois)
- Gregory C. Johnson (Seattle, Washington)
- John M. Grunsfeld (Chicago, Illinois)
- Michael J. Massimino (Franklin Square, New York)
- Andrew J. Feustel (Lake Orion, Michigan)
- Michael T. Good (Broadview Heights, Ohio)
- K. Megan McArthur (Honolulu, Hawaii)

*[nasascience.nasa.gov/astrophysics](http://nasascience.nasa.gov/astrophysics)*

*[www.nasa.gov/hubble](http://www.nasa.gov/hubble)*

*[www.jsc.nasa.gov/Bios](http://www.jsc.nasa.gov/Bios)*

*Hubble Space Telescope***Across**

- 1 Collection of a million to a trillion stars, along with gas and dust, all held together by gravity
- 2 The dark, pillar-like structures in the HST image “pillars of creation” are made of this gas
- 5 Hubble is sensitive to light from ultraviolet through infra—
- 7 First name of the American astronomer after whom the HST is named

**Down**

- 1 NASA Field Center responsible for HST management
- 3 Month in 2008 that the fifth and final HST servicing mission is scheduled to occur
- 4 Spacewalk by another name; also known as extravehicular activity
- 6 Number of spacewalks planned for the October 2008 Hubble servicing mission

Answers—Across: Galaxy, Hydrogen, Red, Edwin; Down: Goddard, October, EVA, Five

## NASA Word Find—Search for NASA words

N E P T U N E H S T A S D  
 E S P I L C E P H C A M E  
 E L B B U H R M U L Y I W  
 A S T R O N A U T I A L E  
 S I N O A S G A T E R K L  
 U A D A S T G A L A X Y O  
 N R O V E R S A E S U W H  
 S E L O H K C **A** L B K A M  
 P M B N D S L O **I** I D Y R  
 O P J U P I T E R **R** L B O  
 T H I K L S Y G R E N E W  
 O L L O P A C I M S O C O

- |           |         |           |          |
|-----------|---------|-----------|----------|
| ✓ Air     | Energy  | Milky Way | Shuttle  |
| Apollo    | Galaxy  | Nebula    | Sky      |
| Astronaut | Galileo | Neptune   | Star     |
| Atlas     | Hubble  | Nova      | Sunspot  |
| Blackhole | Jupiter | Orbit     | Wormhole |
| Cosmic    | Mach    | Rover     | Xray     |
| Eclipse   | Mass    | Scale     |          |

# NASA Major Events Calendar

## 2008

- **Oct. 5** IBEX Launch, Reagan Test Site, Kwajalein Atoll  
*Solar wind – interstellar material investigation mission*
- **Oct. 8+** STS-125 Shuttle Launch (Hubble), Kennedy Space Center, FL  
*Final Hubble servicing mission*
- **Oct. 24-25** NASA Lunar Lander Centennial Challenge, Alamogordo, NM  
*Competition to build and fly a rocket-powered vehicle simulating the flight of a vehicle on the Moon*
- **Nov. 10+** STS-126 Shuttle Launch, Kennedy Space Center, FL  
*Space Station mission (Multi-Purpose Logistics Module)*
- **Dec. 16\*** GOES-O Launch, Cape Canaveral Air Force Station, FL  
*Environmental climate weather imaging mission*

## 2009

- **Jan. 15** OCO Launch, Vandenberg Air Force Base, FL  
*Earth atmospheric carbon dioxide measurement mission*
- **Feb. 4** NOAA-N Prime Launch, Vandenberg Air Force Base, FL  
*Weather prediction and climate research satellite mission*
- **Feb. 12+** STS-119 Shuttle Launch, Kennedy Space Center, FL  
*Space Station mission (starboard truss segment)*
- **Feb. 27\*** LRO/LCROSS Launch, Cape Canaveral Air Force Station, FL  
*Robotic return to the moon mission*
- **April 10** Kepler Launch, Cape Canaveral Air Force Station, FL  
*Search for Earth-size and smaller planets in our region of the Milky Way galaxy*
- **May 15+** STS-127 Shuttle Launch, Kennedy Space Center, FL  
*Space Station mission (Six person crew; Kibo laboratory exposed facility)*
- **June 15** Glory Launch, Vandenberg Air Force Base, FL  
*Earth sciences climate system mission investigating aerosols and black carbon and Sun's irradiance*
- **July 30+** STS-128 Shuttle Launch, Kennedy Space Center, FL  
*Space Station mission (Multi-Purpose Logistics Module experiment and storage racks)*
- **Sept. 15\*** Mars Science Laboratory Launch, Kennedy Space Center, FL  
*Mars rover mission to investigate planet's past or future habitability*
- **Oct. 15+** STS-129 Shuttle Launch, Kennedy Space Center, FL  
*Space Station mission (equipment re-supply including gyroscopes and robotic arm parts)*
- **Nov.+** WISE Launch, Kennedy Space Center, FL  
*Survey of entire sky's mid-infrared cataloguing hundreds of millions of astronomical objects*
- **Dec. 10+** STS-130 Shuttle Launch, Kennedy Space Center, FL  
*Space Station mission (Node 3 and Cupola, a robotic control station)*

**LEGEND:** + Targeted For | \* No Earlier Than (Tentative)

[www.nasa.gov/missions/highlights/schedule.html](http://www.nasa.gov/missions/highlights/schedule.html)

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