



# NASA Astronaut Selection and Training



Overview by

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Aspiring NASA Astronaut Candidate



March 2012



# Agenda

- Definition
- Categories
- Overview of Astronaut Selection Process
  - Qualifications
  - Interviews
  - Training
  - Steps
- Astronauts Hobbies
- Recommendations
- Some Useful Websites



# Definition of Astronaut

- The term "astronaut" derives from the Greek words meaning "space sailor," and refers to all who have been launched as crew members aboard NASA spacecraft bound for orbit and beyond.
- Since the inception of NASA's human space flight program, we have also maintained the term "astronaut" as the title for those selected to join the NASA corps of astronauts who make "space sailing" their career profession.
- The term "cosmonaut" refers to those space sailors who are members of the Russian space program.



# Definition of Astronaut

## (continued)

- The crew of each launched spacecraft is made up of astronauts and/or cosmonauts.
- The crew assignments and duties of commander, pilot, Space Shuttle mission specialist, or International Space Station flight engineer are drawn from the NASA professional career astronauts.
- A special category of astronauts typically titled "payload specialist" refers to individuals selected and trained by commercial or research organizations for flights of a specific payload on a space flight mission. At the present time, these payload specialists may be cosmonauts or astronauts designated by the international partners, individuals selected by the research community, or a company or consortia flying a commercial payload aboard the spacecraft.



# Space Flyers Categories



- Active astronauts are U.S. astronauts who are currently eligible for flight assignment, including those who are assigned to crews.
- Management astronauts are experienced astronauts who have been promoted to other positions within NASA, or astronauts on special duty assignments or sabbaticals that make them unavailable for direct support to the Astronaut Office.
- Former astronauts are those who have left NASA after a career in the Astronaut Corps, including those who are deceased.
- International astronauts are those individuals from international space agencies who have trained at Johnson Space Center and serve as mission specialists with NASA.
  - Astronauts:
    - NASA
    - Canadians
    - Japanese
    - Europeans
  - Cosmonauts:
    - Russians
    - Tourists....



# Astronaut Selection Facts

- The first U.S. astronauts were selected in 1959, before human spaceflight operations began. NASA asked the military services to provide a list of personnel who met specific qualifications.

After stringent screening, NASA announced its selection of seven men, all pilots, as the first American astronauts.

NASA has selected 18 more groups of astronauts since the “Original Seven.”

The backgrounds of NASA’s latest group of [Astronaut Candidates](#) include school teachers, doctors, scientist, and engineers.



*Scott Carpenter,  
Gordon Cooper,  
John Glenn,  
Gus Grissom,  
Walter Schirra,  
Alan Shepard, and  
Deke Slayton.*

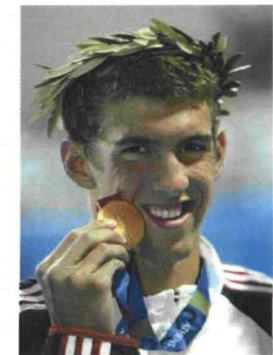
- NASA selects astronauts from a diverse pool of applicants with a wide variety of backgrounds.  
From the thousands of applications received, only a few are chosen for the intensive Astronaut Candidate training program.  
Including the “Original Seven”, only **330** astronauts have been selected to date.
- The astronauts of the 21st century will help lead NASA through the next steps of its [Vision](#) for Space Exploration as we explore the Moon, Mars, and beyond.



# General Program Requirements



- 1) Selected applicants will be designated Astronaut Candidates and will be assigned to the Astronaut Office at the Johnson Space Center, Houston, Texas.
- 2) The astronaut candidates will undergo a training and evaluation period lasting Approximately 2 years, during which time they will participate in the basic Astronaut Candidate training program, which is designated to develop the knowledge and skills required for formal mission training upon selection for a flight. Astronaut Candidates (Piloting background) will maintain proficiency in NASA aircraft during their candidate period.  
*(Applicant → Candidate → Astronaut "penguin" → Flown Astronaut)*
- 3) As part of the Astronaut Candidate training program, Astronaut Candidates are required to complete military water survival before beginning their flying syllabus, and become SCUBA qualified to prepare them for the EVA training. Consequently, all Astronaut Candidates will be required to pass a swimming test during their first month of training. They must swim 3 lengths of a 25-M pool without stopping, and then swim 3 lengths of the pool in a flight suit and tennis shoes. There is no time limit. They must also tread water continuously for 10 minutes.





# General Program Requirements

(continued)



- 4) Applicants should be aware that selection as an Astronaut Candidate does **NOT** ensure selection as an astronaut.  
**Final selection as an astronaut** will depend upon satisfactory completion of the training and evaluation period.  
Civilian candidates who successfully complete the training and evaluation and are selected as astronauts will become permanent Federal employees and will be expected to remain with NASA for a period of at least 5 years.
  
- 5) Civilian candidates who are **NOT** selected as astronauts may be placed in other positions within NASA, depending upon Agency requirements and labor constraints at that time.  
Successful military candidates will be detailed to NASA for a specified tour of duty.
  
- 6) NASA has an affirmative action program goal of having qualified minorities and women among those selected as Astronaut Candidates.  
Therefore, qualified minorities and women are encouraged to apply.





# Minimum Requirements for each of the 3 positions



<p><b>Mission Specialists: (Educators &amp; Non Educators)</b></p>	<p><b>Astronaut Candidate (Non-Piloting background)</b> Bachelor's degree from an accredited institution in engineering, biological science, physical science, or mathematics. Quality of academic preparation is important. Degree must be followed by at least 3 years of related, progressively responsible, professional experience. An advanced degree is desirable and may be substituted for experience as follows:     master's degree = 1 year of experience, doctoral degree = 3 years of experience. Teaching experience, including experience at the K - 12 levels, is considered to be qualifying experience for the Astronaut Candidate position; therefore, educators are encouraged to apply. Ability to pass the NASA long-duration space flight physical, which includes the following specific requirements:</p> <p>    Distant visual acuity: Must be correctable to 20/20, each eye</p> <p><b>(NOTE:</b> For those applicants under final consideration, additional visual screening will be performed to include the following standards: refractive error (distant vision)-cycloplegic refractive error must be between +5.50 and -5.50 diopters in any meridian. Astigmatism may require up to 3.00 diopters of cylinder correction. Anisometropia of up to 3.50 diopters. You are not required to provide this information with your initial application. We will request it later if needed.)</p> <p>    Near visual acuity: Must be correctable to 20/20, each eye</p> <p><b>The refractive surgical procedures of the eye, PRK and LASIK, are now allowed,</b> providing at least 1 year has passed since the date of the procedure with no permanent adverse after effects. For those applicants under final consideration, an operative report on the surgical procedure will be requested.</p> <p>Blood pressure not to exceed 140/90 measured in a sitting position</p> <p>    Standing height between 62 and 75 inches (5' 2" and 6'3")</p>
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# Minimum Requirements for each of the 3 positions

(continued)



## Pilot

(Applicants with less than Jet aircraft pilot licenses do NOT qualify for this position)

...frequent flyer miles do not count, sorry !

### Astronaut Candidate (Piloting background)

Bachelor's degree from an accredited institution in engineering, biological science, physical science or mathematics. An advanced degree is desirable. Quality of academic preparation is important.

At least 1,000 hours pilot-in-command time in jet aircraft. Flight test experience is highly desirable.

Ability to pass the NASA long-duration space flight physical which includes the following specific requirements:

Distant visual acuity: Must be correctable to 20/20, each eye

(NOTE: For those applicants under final consideration, additional visual screening will be performed to include the following standards: refractive error (distant vision)-cycloplegic refractive error must be between +3.50 and -4.00 diopters in any meridian. Astigmatism may require up to 2.00 diopters of cylinder correction. Anisometropia of up to 2.50 diopters. You are not required to provide this information with your initial application. We will request it later if needed.)

Near visual acuity: Must be correctable to 20/20 each eye

**The refractive surgical procedures of the eye, PRK and LASIK, are now allowed**, providing at least 1 year has passed since the date of the procedure with no permanent adverse after effects. For those applicants under final consideration, an operative report on the surgical procedure will be requested.

Blood pressure not to exceed 140/90 measured in a sitting position

Standing height between 62 and 75 inches (5' 2" and 6'3")



# Pay and Benefits for Astronaut Candidates



Source	Guidelines
Civilian	<p><b>Salaries for civilian Astronaut Candidates are based on the Federal Government's General Schedule pay scales for grades GS-11 through GS-14, and are set in accordance with each individual's academic achievements and experience.</b></p> <p><b>Currently, a GS-11 starts at \$64,724 per year and a GS-14 can earn up to \$141,715 per year.</b></p>
Military	<p><b>Selected military personnel will be detailed to the Johnson Space Center but will remain in an active duty status for pay, benefits, leave, and other similar military matters.</b></p>



# 2012 - 2013 Astronaut Application

Position Description

Application Form

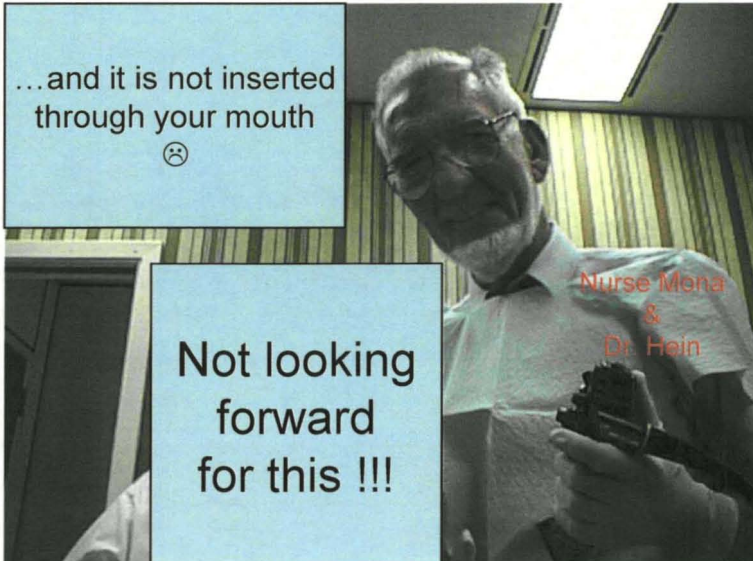
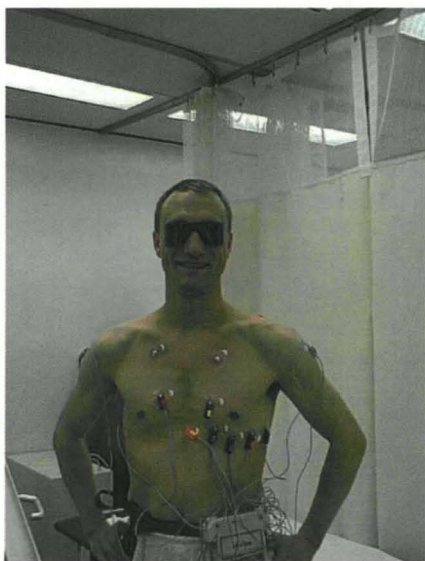
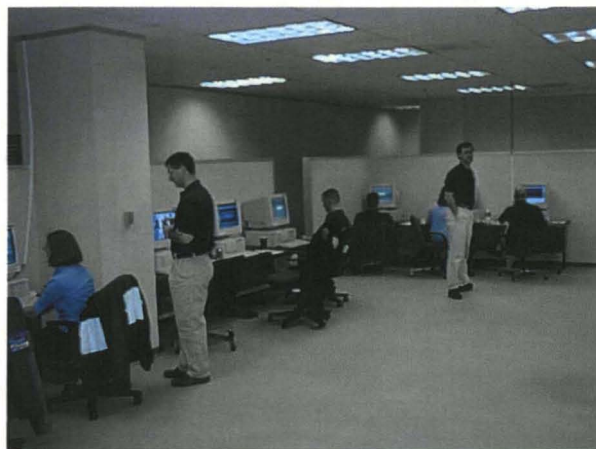
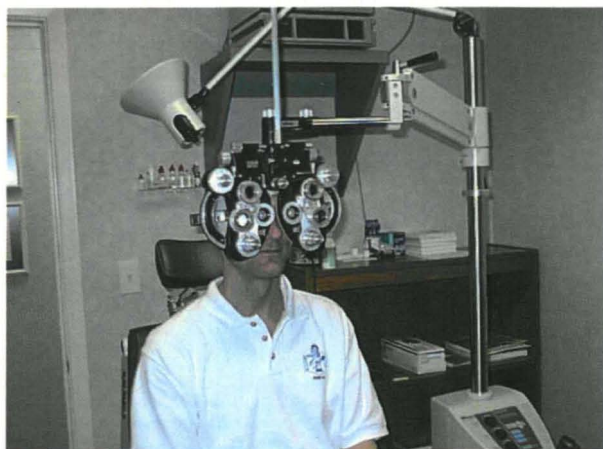
- Electronic Filing !!!
- Resumix file
  - Supplemental Form





# Astronaut Interview Process

(Continued)



Additional activities:

- Essay
- Panel Interview
- Individual Interviews
  
- X-Rays
- MRI (new)
- and more...



Levels of notification:

1st ☺

Amount of Candidates

ASTRONAUT CANDIDATE SELECTION PROCESS TIMELINE

In Progress...

2nd ☺

3rd

4th

5th

	September 2007	Vacancy Announcement opens in USAJOBS
3,535 applications	July 1, 2008	Vacancy Announcement closes
2,800 (Top 79.2%)	September - October 2008	Qualified Applications reviewed to determine Highly Qualified applicants
400 (Top 11.3%)	October - November 2008	Highly Qualified applications reviewed to determine Interviewees
120 (Top 3.4%)	November 2008 - January 2009	Interviewees brought to JSC for preliminary interview, medical evaluation, and orientation
☺	February 2009	Finalists determined
40 - 50 (Top 1.41%)	February - March 2009	Finalists brought to JSC for additional interview and complete medical evaluation
12 - 15 (Top 0.42%)	May 2009	Astronaut Candidate Class of 2009 announced
	August 2009	Astronaut Candidate Class of 2009 reports to the Johnson Space Center

Note: This schedule is subject to change.



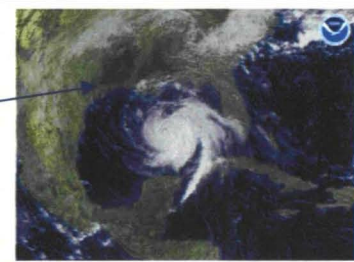
- + Inspector General Hotline
- + No Fear Act
- + Budgets, Strategic Plans and Accountability Reports
- + Freedom of Information Act
- + The President's Management Agenda
- + NASA Privacy Statement, Disclaimer, and Accessibility Certification
- + JSC Web Accessibility and Policy Notices



NASA Official: Mike McCann  
 Last Updated: 06 Mar 2008  
 + Astronaut Selection Curator  
 + Contact Phone: 1-877-NSSC123



...and yes, Astronauts have to move to Texas!





# Astronaut Selection Process Timeline



Step	Amount of Candidates	Percentage of Applicants	Deadline	Event
1st ☺		-	November 15, 2011	Vacancy Announcement opens in USAJOBS.
2nd ☺	<u>6,372</u>	100%	January 27, 2012	Vacancy Announcement closes.
3rd	2,800 / 6,372 = 43.94%	43.94%	March-July 2012	Qualified Applications reviewed to determine Highly Qualified applicants. Qualifications Inquiry form sent to Supervisors/References and civilian applicants contacted by mail to obtain an FAA medical exam.
4th	400	6.28%	June-September 2012	Highly Qualified applications reviewed to determine Interviewees.
5th	120	1.88%	August-October 2012	Interviewees brought to JSC for preliminary interview, medical evaluation, and orientation. Interviewees will be selected from the Highly Qualified group and contacted on a week-by-week basis.
6th	50	0.78%	October 2012	Finalists determined.
7th	50	0.78%	November 2012- January 2013	Finalists brought to JSC for additional interview and complete medical evaluation.
8th	9 - 15	0.14% - 0.24%	March 2013	Astronaut Candidate Class of 2013 announced.
9th	9 - 15	0.14% - 0.24%	June 2013	Astronaut Candidate Class of 2013 reports to the Johnson Space Center.





# My Astronaut Application Progress: Increasing my Odds !?



Attempt # (my age)	Year	Degrees completed at time of application	Other Activities	Comments
1 (24)	1991	BS in Electrical Engineering	Graduate studies	Did not meet minimum requirements (3 years of professional experience)
2	1993	BS in Electrical Engineering MS in Engineering Management	College Professor	Eligible to apply ! Levels advanced: 1. Levels to go: 4
3	1995	BS in Electrical Engineering MS in Engineering Management	Robotics & Automation	Did not advance to the next level
4	1997	BS in Electrical Engineering MS in Engineering Management MS in Electrical Engineering	College Professor	Did not advance to the next level
5	1999	BS in Electrical Engineering MS in Engineering Management MS in Electrical Engineering	American Sign Language, SCUBA	Did not advance to the next level
	2001	BS in Electrical Engineering MS in Engineering Management MS in Electrical Engineering Ph.D. in Electrical Engineering	College Professor, Research	No Class Selection this year
6	2003	BSEE, MSEM, MSEE, PhDEE	Project Management Professional Certification	Advanced to the next level ! 😊 Levels advanced: 2. Levels to go 3
	2005	BSEE, MSEM, MSEE, PhDEE	College Professor, NASA Fellowship	No Class Selection this year
7 (41)	2008	BSEE, MSEM, MSEE, PhDEE	College Professor, Private Pilot, Multi-Center Project Experience, Russian Language	Back to square 1 !
8 (45)	2012	BSEE, MSEM, MSEE, PhDEE	College Professor, Private Pilot, Multi-Center Project Experience, Orion Capsule EGSE Lead	Hope to get selected ! 😊



If you applied, what would be your chances of being part of the 2013 Astronaut Candidate Class ?

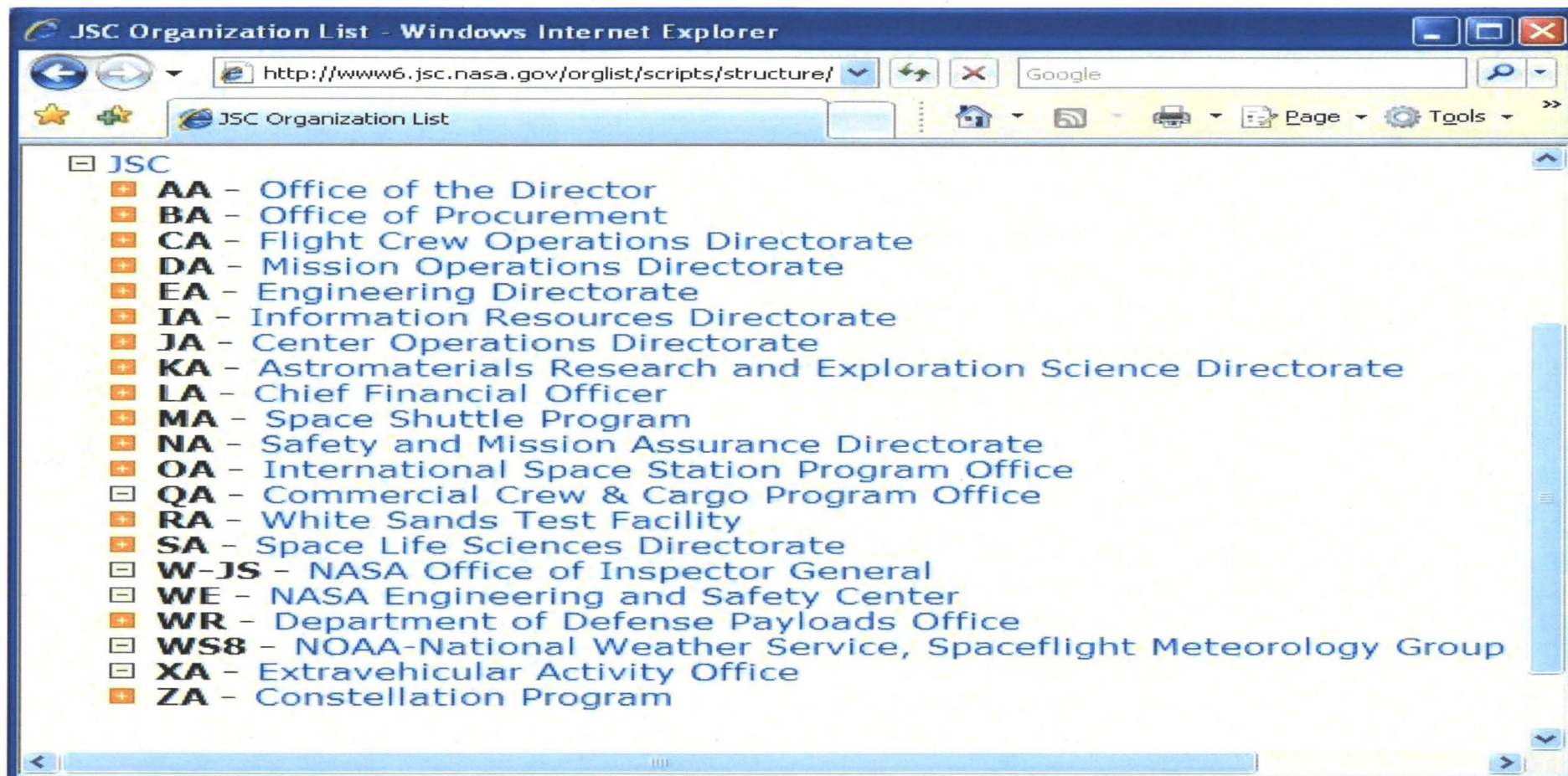


<b>Position</b>	<b>Odds*</b>	<b>Percentage</b>
<b>Pilot</b>	<b>4 / 6,372</b>	<b>0.06277%</b>
<b>Mission Specialist</b>	<b>4 / 6,372</b>	<b>0.06277%</b>
<b>Educator Astronaut</b>	<b>4 / 6,372</b>	<b>0.06277%</b>

\*Assuming exclusive probability or 12 Astronaut Candidates selected.



# 2007 Astronauts Poster



- 113 in 2007 Poster (23 women, 90 male)
- Attrition rate:  $\approx$  6 per year
- Astronaut's Representatives needed



# 2004 Astronaut Candidate Class



\* Data as of 2004

	Astronaut's Name	Age*	Classification	Affiliation	Education / Former Job
1	<a href="#">Joe Acaba</a> (assigned to STS-119, 2009)	36	Mission Specialist (Educator)	Dunnellon Middle School in Dunnellon, FL	MS Geology / Science & math teacher
2	<a href="#">Ricky Arnold</a> (assigned to STS-119, 2009)	40	Mission Specialist (Educator)	American International School of Bucharest in Romania	MS Marine, Estuarine and Environmental Science / Science & math teacher
3	<a href="#">Dottie Metcalf-Lindenburger</a> (not yet assigned)	28	Mission Specialist (Educator)	Hudson's Bay High School in Vancouver, WA	BS Geology / Science teacher
4	<a href="#">Chris Cassidy</a> (assigned to STS-127, 2009)	34	Mission Specialist	Navy	MS Ocean Engineering / Navy Lieutenant commander
5	<a href="#">Jose Hernandez</a> (assigned to STS-128, 2009)	41	Mission Specialist	NASA JSC	MS Electrical Engineering / Branch Chief
6	<a href="#">Shane Kimbrough</a> (assigned to STS-126, 2008)	36	Mission Specialist	Army / NASA JSC	(MS Operations Research / Flight Simulation Engineer (Army major)
7	<a href="#">Tom Marshburn</a> (assigned to STS-127, 2009)	43	Mission Specialist	NASA JSC	MD., Flight Surgeon
8	<a href="#">Bobby Satcher</a> (not yet assigned)	38	Mission Specialist	Children's Memorial Hospital in Chicago, IL	MD., PhD Orthopedic Surgeon
9	<a href="#">Shannon Walker</a> (backup Expedition 19)	38	Mission Specialist	NASA JSC	PhD Astrophysics / Acting Manager
10	<a href="#">Akihiko Hoshide</a> (already flew: STS-124, 2008)	36	Mission Specialist	Japan Exploration Agency	MS Aerospace Engineering / Astronaut support engineer
11	<a href="#">Naoko Yamazaki</a> (not yet assigned)	34	Mission Specialist	Japan Exploration Agency	MS Aerospace Engineering / JEM Project Team
12	<a href="#">Randy Bresnik</a> (not yet assigned)	36	Pilot	Marine Corps	MS Aviation Systems / Marine Corps Major
13	<a href="#">Jim Dutton</a> (not yet assigned)	35	Pilot	Air Force	MS Aeronautics & Astronautics / Air Force Major

Only 5 of 13: (not yet assigned)

There are no age restrictions for the program.

Astronaut candidates selected in the past have ranged between the ages of 26 and 46, with the average age being 34.

\*The 2004 class age average: 37 years old. (includes Japanese Astronauts). Age Spectrum: 28 - 43.



# 2009 Astronaut Candidate Class



\* Data as of 2009

	Astronaut's Name	Age*	Classification	Affiliation	Former Job
1	Serena M. Aunon	33	Mission Specialist	University of Texas Medical Branch-Wyle	Flight surgeon for NASA's Space Shuttle, International Space Station and Constellation Programs
2	Jeanette J. Epps	38	Mission Specialist	CIA	Technical Intelligence Officer
3	Jack D. Fischer	35	Pilot	US Air Force, Major	Test pilot
4	Michael S. Hopkins	40	Pilot	US Air Force, Lt. Colonel	Special assistant to the Vice Chairman (Joint Chiefs of Staff) at the Pentagon
5	Kjell N. Lindgren	36	Mission Specialist	University of Texas Medical Branch-Wyle	Flight surgeon for NASA's Space Shuttle, International Space Station and Constellation Programs
6	Kathleen (Kate) Rubins	30	Mission Specialist	Whitehead Institute for Biomedical Research	Principal investigator and fellow, Whitehead Institute for Biomedical Research at MIT and conducts research trips to the Congo
7	Scott D. Tingle	43	Mission Specialist	US Navy, Commander	test pilot and Assistant Program Manager-Systems Engineering at Naval Air Station Patuxent River
8	Mark T. Vande	42	Pilot	US Army, Lt. Commander	Test pilot
9	Gregory R. (Reid) Wiseman	33	Pilot	US Navy, Lt. Commander	Test pilot

There are no age restrictions for the program.

Astronaut candidates selected in the past have ranged between the ages of 26 and 46, with the average age being 34.

\*The 2009 US class age average: 37 years old. Age Spectrum: 30 – 43. Additionally, there were 3 Japanese and 2 Canadian Astronauts selected.



# Will you be prepared ?



Step	Year	Your Age	Academic Level	Professional Experience	
1	2012	10	4 <sup>rd</sup> Grade		<p>Degree <b>must be followed</b> by at least 3 years of related, progressively responsible, professional experience or at least 1,000 pilot-in-command time in jet aircraft.</p> <p>An advanced degree is desirable and may be substituted for experience as follows: master's degree = 1 year of experience, doctoral degree = 3 years of experience.</p>
2	2015	13	7 <sup>th</sup> Grade		
3	2020	18	12 <sup>th</sup> Grade		
4	2025	23	Graduate from College		
5	2027	25	Graduated with Masters Degree		
6	2028	26	Eligible to apply to become an Astronaut	3 years	<p>Teaching experience, including experience at the K - 12 levels, is considered to be qualifying experience for the Astronaut Candidate position; therefore, educators are encouraged to apply.</p>
7	2030	28			Selected as an Astronaut
8	2035	33			Selected for Mars Mission !

There are no age restrictions for the program.

Astronaut candidates selected in the past have ranged between the ages of 26 and 46, with the average age being 34.

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# Astronaut Training Process



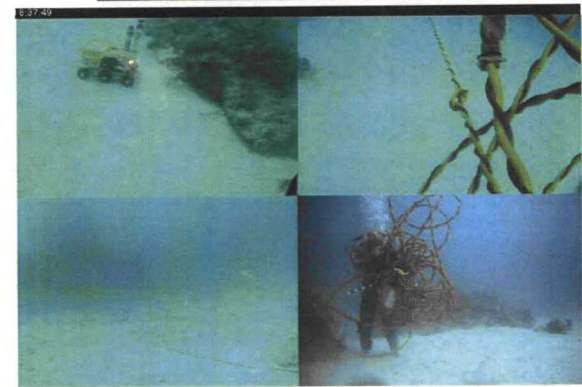
The water within the NBL is recycled every 19.6 hours. It is automatically monitored and controlled to a temperature of 82-88 degrees Fahrenheit to minimize the potential effects of hypothermia on support divers. It is also chemically treated to control contaminant growth while minimizing long-term corrosion effects on training mockups and equipment.

Neutral Buoyancy Laboratory (NBL). The NBL was sized to perform two activities simultaneously; each uses mockups sufficiently large to produce meaningful training content and duration. It is 202 ft in length, 102 ft in width, and 40 ft in depth (20 ft above ground level and 20 ft below) and holds 6.2 million gallons of water. Even at this size, the International Space Station, at 350 ft x 240 ft when complete, will not fit inside the NBL.



# What do Astronauts do at work... ...when they are not flying?

- Training for their missions
- Help others train for their missions
- Support mission from ground
  - Mission Control
  - Be with family & VIP during missions
  - Support design reviews
  - Participate in Brainstorming activities
  - Support fit checks
  - Familiarize with Shuttle systems
  - Familiarize with ISS systems
  - Travel to ISS partners countries
  - Public Affairs & Education Outreach
  - Maintain flying proficiency
  - Conduct Research
  - Familiarize with Robotics and Flight Simulation H/W & S/W
  - ...and much more !





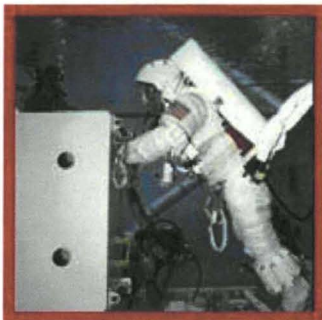
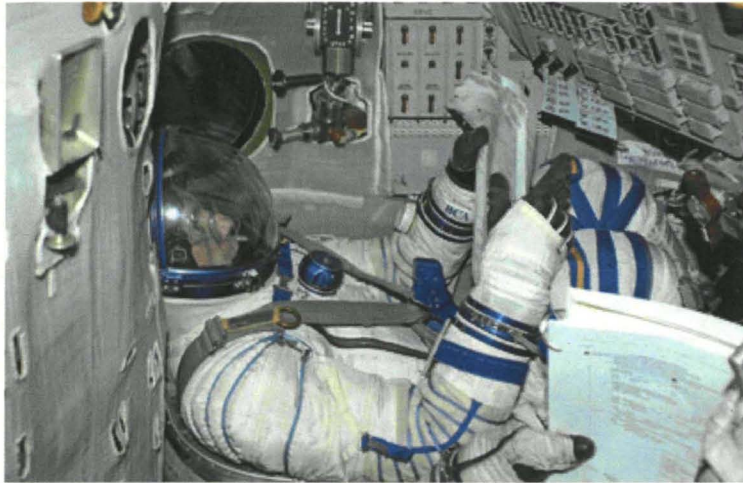


# What do Astronauts do at work... ...when they are not flying?





# “Divide and Conquer !”





## What do some Astronauts do when they are NOT working ?

Human @ Northern Arizona's Meteor Crater



- Auto Repair
- Astronomy
- Basketball
- Baseball
- Bike Mountain
- Bicycling
- Camping
- Collecting Stamps
- Collecting toy trains
- Cooking
- Drawing and Painting
- Exploring Physics
- Flying small planes
- Hiking
- Home Improvement
- Jogging
- Learning Languages
- Golfing
- Playing Musical Instruments
- Photography Reading
- Rock Climbing
- Sailing

- SCUBA Diving
- Sewing
- Singing
- Soccer
- Softball
- Snow skiing
- Spending time with loved ones
- Swimming
- Tap and Jazz Dancing
- Tennis
- Theatre
- Volleyball
- Water Skiing
- Weight training
- Wind Surfing
- Writing software



# Recommendations

- **Your goal to becoming an Astronaut should not be your only goal in life !**
  - **Have faith in God**
  - **Obtain training that will benefit both you and your employer**
  - **Establish interesting, hard to attain but reasonable goals**
  - **Be a role model**
  - **Promote mentorship**
  - **Share your knowledge**
  - **Maintain a clean mind and a healthy body**
  - **Maintain a good attitude, it might dictate your altitude !**
  - **Respect others**
  - **Balance your life**
- **Apply gained skills in your personal and professional life.**



# Some Useful Websites

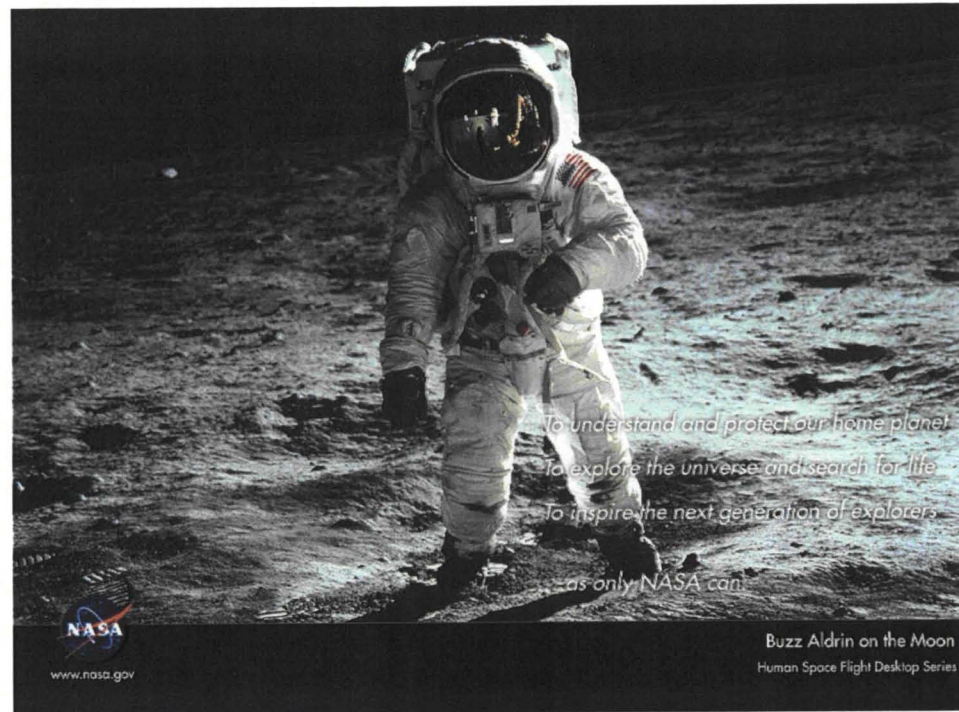
- NASA Fact Sheet Library
  - <http://spaceflight.nasa.gov/spacenews/factsheets/index.html>
- NASA Agency Wide Jobs
  - <http://www.usajobs.gov/>
- Astronaut Selection and Training
  - <http://spaceflight.nasa.gov/shuttle/reference/factsheets/asseltrn.html>
- How to Become and Astronaut 101
  - <http://spaceflight.nasa.gov/outreach/jobsinfo/astronaut101.html>
- Frequently Asked Questions
  - <http://www.nasajobs.nasa.gov/astronauts/content/faq.htm>
- Astronaut Selection Timeline
  - <http://www.nasajobs.nasa.gov/astronauts/content/timeline.htm>
- Astronaut Hopefuls
  - <http://www.ashos.org>



# THANKS



- Comments ?
- Questions ?
- Suggestions ?



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