Space News Update

— November 10, 2017 —

Contents

1. Star Exploded, Survived, and Exploded Again More Than 50 Years Later

It's the celestial equivalent of a horror movie villain—a star that wouldn't stay dead.

An international team of astronomers including Carnegie's Nick Konidaris and Benjamin Shappee discovered a star that exploded multiple times over a period of 50 years. The finding, published by *Nature*, completely confounds existing knowledge of a star's end of life, and Konidaris' instrument-construction played a crucial role in analyzing the phenomenon.

In September 2014, the intermediate Palomar Transient Factory team of astronomers detected a new explosion in the sky, iPTF14hls.

The light given off by the event was analyzed in order to understand the speed and chemical composition of the material ejected in the explosion.

This analysis indicated that the explosion was what's called a type II-P supernova, and everything about the discovery seemed normal. Until, that is, a few months later when the supernova started getting brighter again.

Type II-P supernovae usually remain bright for about 100 days. But iPTF14hls remained bright for more than 600! What's more, archival data revealed a 1954 explosion in the exact same location.

It turned out that somehow this star exploded more than half a century ago, survived, and exploded again in 2014.

"This supernova breaks everything we thought we knew about how they work," said lead author Iair Arcavi of University of California Santa Barbara and Las Cumbres Observatory.

An instrument built by Konidaris was key to analyzing the light emitted by iPTF14hls, which dimmed and brightened at least five times over three years.

Called the SED Machine, Konidaris' tool is able to rapidly classify supernovae and other short-lived astronomical events. A quick turnaround on classifying these kinds of so-called transient objects in the sky was sorely needed when Konidaris and former colleagues at Caltech first built the machine.

Stellar explosions teach astronomers a great deal about the origins of much of the material that makes up our universe. A supernova explosion may even have triggered the formation of our own Solar System.

"But not too long ago it was faster to identify short-lived celestial phenomena than it was to classify them and determine what they could teach us," Konidaris said. "Which is why we built SED, but I never expected it would help us analyze an explosion as strange as this zombie star."

"Nick's role in this discovery demonstrates the importance of having an active instrumentation effort, which is increasingly rare on many campuses," added Observatories Director John Mulchaey.

Source: Phys.org Return to Contents

2. NASA Completes Review of First SLS, Orion Deep Space Exploration Mission

NASA is providing an update on the first integrated launch of the Space Launch System (SLS) rocket and Orion spacecraft after completing a comprehensive review of the launch schedule.

This uncrewed mission, known as Exploration Mission-1 (EM-1) is a critical flight test for the agency's human deep space exploration goals. EM-1 lays the foundation for the first crewed flight of SLS and Orion, as well as a regular cadence of missions thereafter near the Moon and beyond.

The review follows an earlier assessment where NASA evaluated the cost, risk and technical factors of adding crew to the mission, but ultimately affirmed the original plan to fly EM-1 uncrewed. NASA initiated this review as a result of the crew study and challenges related to building the core stage of the world's most powerful rocket for the first time, issues with manufacturing and supplying Orion's first European service module, and tornado damage at the agency's Michoud Assembly Facility in New Orleans.

"While the review of the possible manufacturing and production schedule risks indicate a launch date of June 2020, the agency is managing to December 2019," said acting NASA Administrator Robert Lightfoot. "Since several of the key risks identified have not been actually realized, we are able to put in place mitigation strategies for those risks to protect the December 2019 date."

The majority of work on NASA's new deep space exploration systems is on track. The agency is using lessons learned from first time builds to drive efficiencies into overall production and operations planning. To address schedule risks identified in the review, NASA established new production performance milestones for the SLS core stage to increase confidence for future hardware builds. NASA and its contractors are supporting ESA's (European Space Agency) efforts to optimize build plans for schedule flexibility if sub-contractor deliveries for the service module are late.

NASA's ability to meet its agency baseline commitments to EM-1 cost, which includes SLS and ground systems, currently remains within original targets. The costs for EM-1 up to a possible June 2020 launch date remain within the 15 percent limit for SLS and are slightly above for ground systems. NASA's cost commitment for Orion is through Exploration Mission-2. With NASA's multi-mission approach to deep space exploration, the agency has hardware in production for the first and second missions, and is gearing up for the third flight. When teams complete hardware for one flight, they're moving on to the next.

As part of the review, NASA now plans to accelerate a test of Orion's launch abort system ahead of EM-1, and is targeting April 2019. Known as Ascent-Abort 2, the test will validate the launch abort system's ability to get crew to safety if needed during ascent. Moving up the test date ahead of EM-1 will reduce risk for the first flight with crew, which remains on track for 2023.

Technology Advancements

On both the rocket and spacecraft, NASA is using advanced manufacturing techniques that have helped to position the nation and U.S. companies as world leaders in this area. For example, NASA is using additive manufacturing (3-D printing) on more than 100 parts of Orion. While building the two largest core stage structures of the rocket, NASA welded the thickest structures ever joined using self-reacting friction stir welding.

SLS has completed welding on all the major structures for the mission and is on track to assemble them to form the largest rocket stage ever built and complete the EM-1 "green run," an engine test that will fire up the core stage with all four RS-25 engines at the same time.

NASA is reusing avionics boxes from the Orion EM-1 crew module for the next flight. Avionics and electrical systems provide the "nervous system" of launch vehicles and spacecraft, linking diverse systems into a functioning whole.

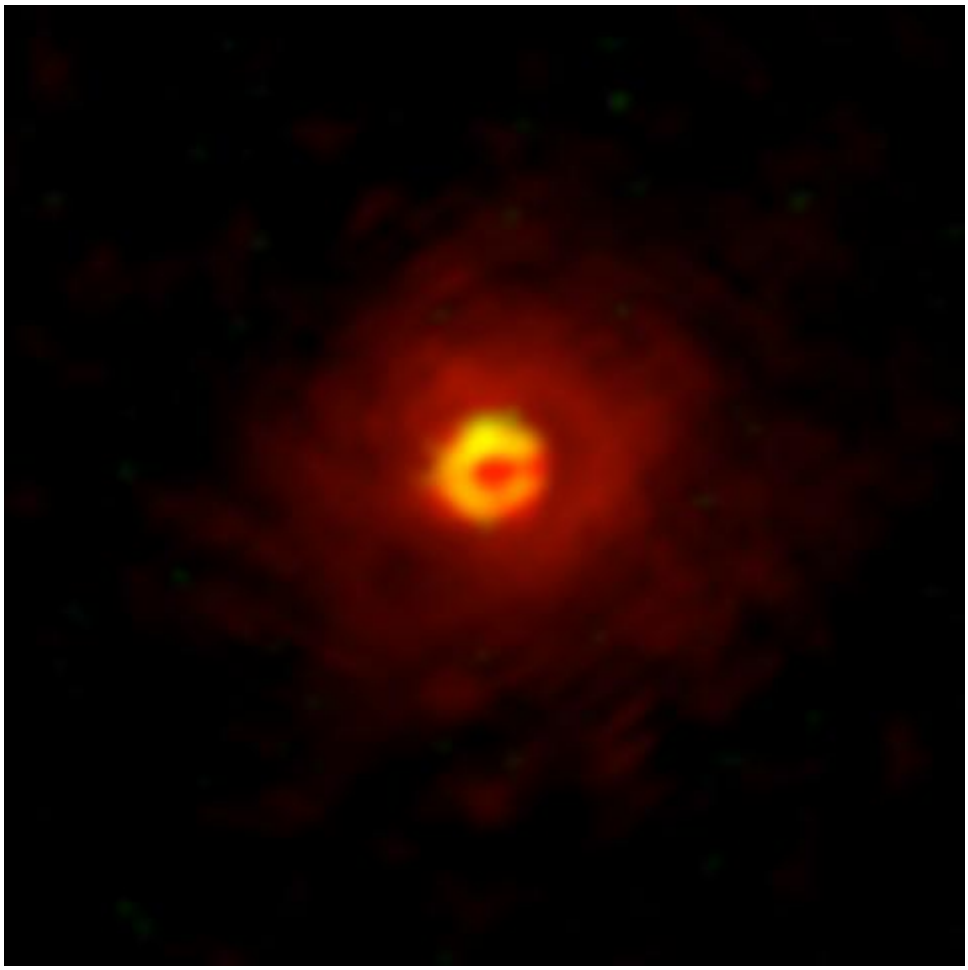
For ground systems, infrastructure at NASA's Kennedy Space Center in Florida is intended to support the exploration systems including launch, flight and recovery operations. The center will be able to accommodate the evolving needs of SLS, Orion, and the rockets and spacecraft of commercial partners for more flexible, affordable, and responsive national launch capabilities.

EM-1 will demonstrate safe operations of the integrated SLS rocket and Orion spacecraft, and the agency currently is studying a deep space gateway concept with U.S. industry and space station partners for potential future missions near the Moon.

"Hardware progress continues every day for the early flights of SLS and Orion. EM-1 will mark a significant achievement for NASA, and our nation's future of human deep space exploration," said William Gerstenmaier, associate administrator for NASA's Human Exploration and Operations Mission Directorate in Washington. "Our investments in SLS and Orion will take us to the Moon and beyond, advancing American leadership in space."

Source: NASA Return to Contents

3. Winds Blowing off a Dying Star



Stars like our Sun eject large amounts of gas and dust into space, containing various elements and compounds. *Asymptotic giant branch* -- AGB -- phase stars, near their end of life, are particularly significant sources of such substances in our galaxy.

Formation of dust around AGB stars has been considered to play an important role in triggering acceleration of stellar wind, but the detailed mechanism of this acceleration has not been well explained.

And there is yet another conundrum. In space, silicon is ten times more abundant than aluminum. However, many oxygen-rich AGB stars are rich in aluminum oxide dust -- the major carrier of aluminum -- but poor in silicate dust -- the carrier of silicon, which has puzzled researchers: why is aluminum oxide dust so abundant around oxygen-rich AGB stars?

In a paper published in *Science Advances*, a research team led by Aki Takigawa of Kyoto University have utilized the Atacama Large Millimeter/submillimeter Array -- ALMA, as the high spatial-resolution radio interferometer in Chile is known -- to obtain detailed images of gas molecules forming dust surrounding an AGB star.

"Previously, there was a limit to how well we could observe dust forming regions close to stars," explains Takigawa. "Now, thanks to the high spatial resolution of ALMA, we can obtain images of gases in these regions in finer detail. So we pointed ALMA toward an aluminum oxide-rich AGB star, *W Hydrae*."

Gas molecules aluminum monoxide and silicon monoxide -- AlO and SiO -- eventually form aluminum oxide and silicate dust. The team observed that AlO was distributed within three stellar radii of W Hydrae, which was surprisingly similar to the previously-observed dust distribution.

Meanwhile, SiO was detected beyond five stellar radii, and moreover 70% remained gaseous, without forming into dust.

"These results indicate that as aluminum oxide grows and accumulates near a star, the addition of a small amount of silicate dust may trigger wind acceleration," elaborates Takigawa. "This decreases gas density, suppressing further silicate dust formation."

"This may explain the presence of aluminum-oxide-rich but silicate-poor AGB stars."

These new results shed light not only on the dynamics of gas and dust surrounding stars, but also on the importance of studying both together. The team plans to continue using ALMA to elucidate gas and dust dynamics in the universe.

Source: Eureka Alert Return to Contents

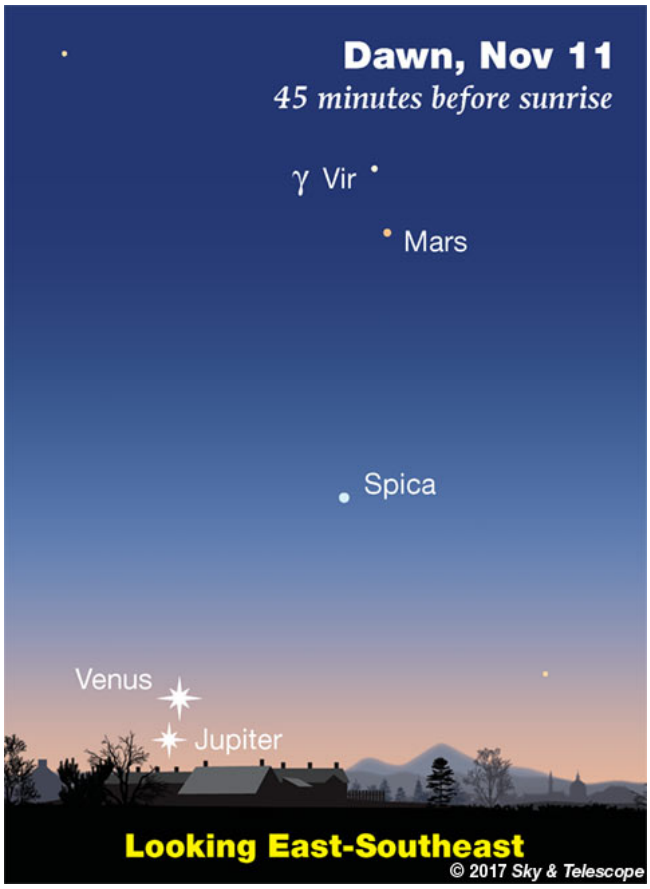
The Night Sky

Friday, November 10

• The eclipsing variable star Algol in Perseus should be at its minimum brightness, magnitude 3.4 instead of its usual 2.3, for a couple hours centered on 7:45 p.m. Eastern Standard Time. At any *random* time you glance up at Algol, you have only a 1 in 30 chance of catching it at least a magnitude fainter than normal.

Regulus emerged from behind the crescent Moon's bright limb last July 25th as seen from Kuala Lumpur, Malaysia, where Shahrin Ahmad took a telescopic video.

• Plan for this one now: In broad daylight on Saturday morning the 11th, the Moon, just past last quarter, occults Regulus for much of North America in a blue sky. You'll need a telescope and very clear air. The star disappears on the Moon's bright limb and reappears from behind the dark limb. See the November Sky & Telescope, page 51. Map and local timetables.



Saturday, November 11

• Vega is the brightest star shining in the west in early evening. Its little constellation Lyra extends to the left. Somewhat farther left, about a fist and a half at arm's length from Vega, is 3rd-magnitude Albireo, the beak of Cygnus — a beautiful telescopic double star.

Sunday, November 12

• Orion is clearing the eastern horizon by 8 or 9 p.m. this week (depending on how far east or west you live in your time zone). His three-star belt is nearly vertical. High above Orion shines orange Aldebaran. Above Aldebaran is the little Pleiades cluster, the size of your fingertip at arm's length. Far left of Aldebaran and the Pleiades shines bright Capella

Monday, November 13

• Around 7 or 8 p.m. this week, the Great Square of Pegasus stands in its level position very high toward the south. (It's straight overhead if you're as far south as Miami.) Its right (western) side points very far down toward Fomalhaut. Its eastern side points less directly toward Beta Ceti (also known as Deneb Kaitos or Diphda), not as far down.

Looking lower: If you have a very good view to a dark south horizon — and if you're not much farther north than roughly New York, Denver, or Madrid — picture an equilateral triangle with Fomalhaut and Beta Ceti as its top two corners. Near where the third corner would be is Alpha Phoenicis, or Ankaa, in the constellation Phoenix. It's magnitude 2.4, not very bright but the brightest thing in its area. It has a yellow-orange tint; binoculars help to check. Have you ever seen *anything* of the constellation Phoenix before?

Source: Sky & Telescope

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ISS Sighting Opportunities

For Denver:

Date	Visible	Max Height	Appears	Disappears
Sat Nov 11, 4:53 AM	< 1 min	11°	11° above NNE	10° above NNE
Sun Nov 12, 5:36 AM	4 min	19°	10° above NNW	13° above ENE
Mon Nov 13, 4:46 AM	1 min	14°	14° above NNE	11° above NE
Mon Nov 13, 6:20 AM	< 1 min	15°	10° above NW	15° above NW
Tue Nov 14, 5:28 AM	3 min	34°	17° above NNW	26° above ENE

Sighting information for other cities can be found at NASA's Satellite Sighting Information

NASA-TV Highlights

(all times Eastern Daylight Time)

Friday, November 10

3 p.m., Orbital ATK CRS-8 Cargo Resupply Mission What's on Board Briefing (all channels)

7 p.m.,10 p.m., Replay of the Orbital ATK CRS-8 Cargo Resupply Mission What's on Board Briefing (all channels)

9 p.m., Friday, November 10 - Replay of the Orbital ATK CRS-8 Cargo Resupply Mission Pre-Launch News Conference (all channels)

Saturday, November 11

4 a.m., Replay of the Orbital ATK CRS-8 Cargo Resupply Mission Pre-Launch News Conference (all channels)

5 a.m., Replay of the Orbital ATK CRS-8 Cargo Resupply Mission What's on Board Briefing (all channels)

7 a.m., Coverage of the Launch of the Orbital ATK Antares/Cygnus on the CRS-8 Mission to the ISS (Launch scheduled at 7:37 a.m. ET) (all channels)

9 a.m., Coverage of the Solar Array Deployment on the Orbital ATK Cygnus Cargo Craft (all channels)

10 a.m., Orbital ATK Cygnus/CRS-8 Post-Launch News Conference (time subject to change) (all channels)

1 p.m., 5 p.m., 8 p.m., Replay of the Launch of the Orbital ATK Antares/Cygnus on the CRS-8 Mission to the ISS (all channels)

2 p.m., 6 p.m., 9 p.m., Replay of the Orbital ATK Cygnus/CRS-8 Post-Launch News Conference (all channels)

Sunday, November 12

10 a.m., 2 p.m., 6 p.m., Replay of the Launch of the Orbital ATK Antares/Cygnus on the CRS-8 Mission to the ISS (all channels)

4 p.m., Prelaunch News Conference for Joint Polar Satellite System (JPSS-1) from Vandenberg AFB, California (all channels)

5:30 p.m., Science Briefing for Joint Polar Satellite System (JPSS-1) from Vandenberg AFB, California (all channels)

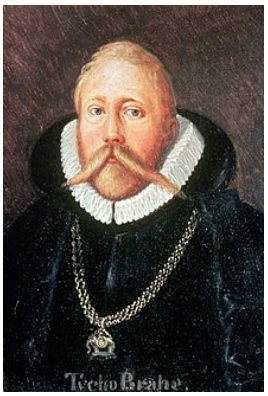
7 p.m., 9 p.m., Replay of the Prelaunch News Conference for Joint Polar Satellite System (JPSS-1) from Vandenberg AFB, California (all channels)

8 p.m., Replay of the Science Briefing for Joint Polar Satellite System (JPSS-1) from Vandenberg AFB, California (all channels)

Watch NASA TV on the Net by going to the NASA website. Return to Contents

Space Calendar

- Nov 10 - [Nov 08] Apollo Asteroid 2017 VC Near-Earth Flyby (0.025 AU)
- Nov 10 - Apollo Asteroid 2017 UL7 Near-Earth Flyby (0.055 AU)
- Nov 10 - Amor Asteroid 2017 UN7 Near-Earth Flyby (0.067 AU)
- Nov 10 - Amor Asteroid 2017 UA43 Near-Earth Flyby (0.077 AU)
- Nov 10 - Asteroid 19482 Harperlee Closest Approach To Earth (2.595 AU)
- Nov 10 - Asteroid 3202 Graff Closest Approach To Earth (2.740 AU)
- Nov 11 - [Nov 09] Cygnus CRS OA-8E/ EcAMSAT/ ISARA/ Asgardia 1/ CHEFsat/ OCSD B & C/ PropCube 2 Antares 230 Launch (International Space Station)
- Nov 11 - Moon Occults Regulus
- Nov 11 - Comet 183P/Korlevic-Juric Perihelion (3.872 AU)
- Nov 11 - Apollo Asteroid 2005 XB1 Near-Earth Flyby (0.096 AU)
- Nov 11 - Asteroid 3173 McNaught Closest Approach To Earth (1.344 AU)
- Nov 11 - Asteroid 22521 ZZ Top Closest Approach To Earth (1.518 AU)
- Nov 11 - Asteroid 10792 Ecuador Closest Approach To Earth (2.013 AU)
- Nov 11 - Keck Observatory Open House 2017, Kamuela, Hawaii
- Nov 11 - 35th Anniversary (1982), STS-5 Launch (Space Shuttle Columbia)
- Nov 11 - 445th Anniversary (1572), Tycho Brahe's Observation of SN1572
- Nov 12 - Comet C/2015 ER61 (PANSTARRS) At Opposition (1.905 AU)
- Nov 12 - Comet 123P/West-Hartley Closest Approach To Earth (2.717 AU)
- Nov 12 - Asteroid 18235 Lynden-Bell Closest Approach To Earth (1.901 AU)
- Nov 12 - Asteroid 8990 Compassion Closest Approach To Earth (2.428 AU)
- Nov 12 - Richard Truly's 80th Birthday (1937)
- Nov 13 - Venus Passes 0.3 Degrees From Jupiter
- Nov 13 - Comet 219P/LINEAR At Opposition (1.902 AU)
- Nov 13 - Comet 73P-AT/Schwassmann-Wachmann At Opposition (2.491 AU)
- Nov 13 - Comet C/2017 C2 (PANSTARRS) At Opposition (3.090 AU)
- Nov 13 - Comet 297P/Beshore At Opposition (3.568 AU)
- Nov 13 - Comet 86P/Wild At Opposition (3.768 AU)
- Nov 13 - Apollo Asteroid 326354 (2000 SJ344) Near-Earth Flyby (0.073 AU)
- Nov 13 - Atira Asteroid 2014 FO47 Closest Approach To Earth (0.419 AU)
- Nov 13 - Asteroid 4589 McDowell Closest Approach To Earth (1.194 AU)
- Nov 13 - 10th Anniversary (2007), Rosetta, 2nd Earth Flyby



Tycho Brahe

Source: JPL Space Calendar

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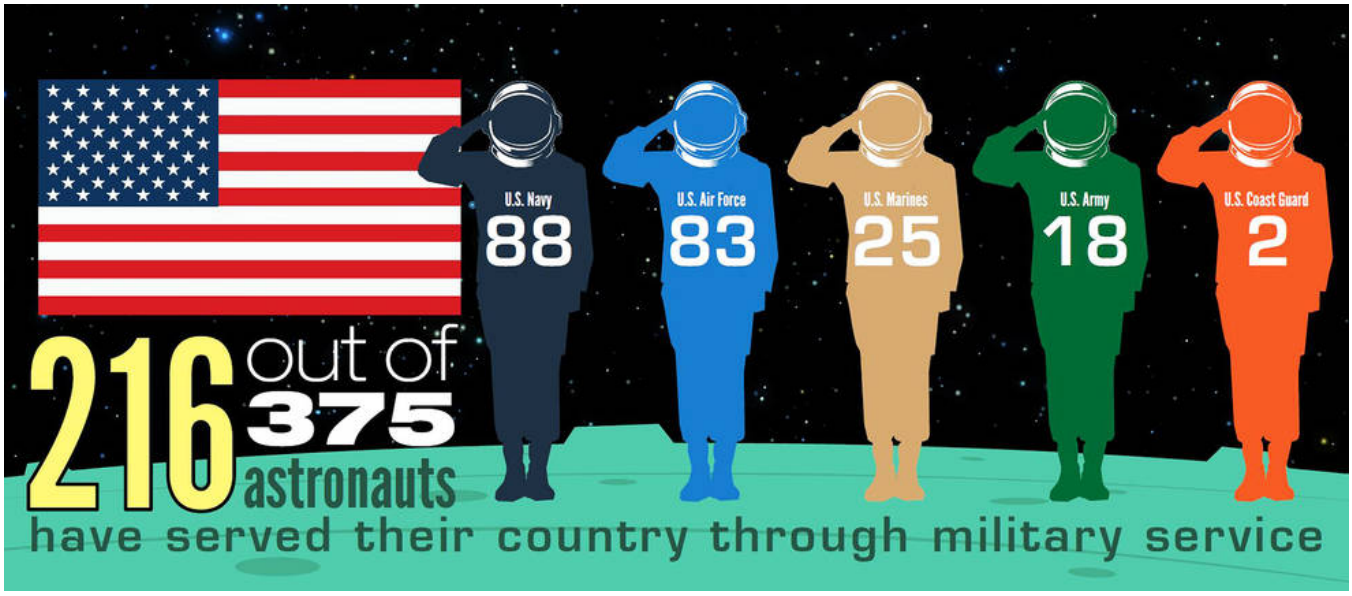
Food for Thought

Veterans Day Salute to NASA's Military Astronauts



Each year, Americans pause on Nov. 11 to celebrate Veterans Day. While the date marks the anniversary of the end of World War I, the annual holiday is designed to honor everyone who served and is serving in the armed forces of the United States. Many of those include NASA astronauts.

When the agency selected the first groups of U.S. astronauts, all were military pilots. That held true until selection of the fourth group, selected in 1965. They were scientists, three of whom served in the military.

As NASA approached the space shuttle era, scientists, doctors and engineers were needed along with pilots. The 35 selected in 1978 included the most diverse group to date including the first women and ethnic minorities. The selections included 13 pilot astronauts along with 22 mission specialists. All of the pilots served in the military, as well as 13 of the mission specialists.

With the 12 NASA astronauts selected in the group announced in June this year, the total number of individuals selected by the agency totals 375 -- 216 served in one of the branches of the U.S. armed services.

During the April 9, 1959, news conference in which NASA's "Original Seven" astronauts were announced, John Glenn commented on the sense of duty he felt serving in the Marines and as an astronaut.

“I think we would be almost remiss in our duty if we didn’t make full use of our talents,” he said. “Every one of us would feel guilty, I think, if we didn’t make the fullest use of our talents in volunteering for something that is as important as this is to our country and the world.”

Source: NASA

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Space Image of the Week

The Prague Astronomical Clock

Explanation: In the center of Prague there's a clock the size of a building. During the day, crowds gather to watch the show when it chimes in a new hour. The Prague Astronomical Clock's face is impressively complex, giving not only the expected time with respect to the Sun (solar time), but the time relative to the stars (sidereal time), the times of sunrise and sunset at several latitudes including the equator, the phase of the Moon, and much more. The clock began operation in 1410, and even though much of its inner workings have been modernized several times, original parts remain. Below the clock is a nearly-equal sized solar calendar that rotates only once a year. Pictured, the Prague Astronomical Clock was photographed alone during an early morning in 2009 March. The Prague Astronomical Clock and the Old Town Tower behind it are currently being renovated once again, with the clock expected to be restarted in 2018 June.

Image Credit & License: Jorge Láscar

Source: APOD

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