

# THE ARMSTRONG XPRESS

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# X-57 arrives



**X-57  
coverage  
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*Artist's concept illustrating a catastrophic collision between two rocky exoplanets in the planetary system BD +20 307, turning both into dusty debris. Ten years ago, scientists speculated that the warm dust in this system was a result of a planet-to-planet collision. Now, SOFIA found even more warm dust, further supporting that two rocky exoplanets collided. This helps build a more complete picture of our own solar system's history. Such a collision could be similar to the type of catastrophic event that ultimately created our Moon.*



NASA/SOFIA/Lynette Cook

# When exoplanets collide

**By Cassandra Bell and Joan Schmelz**  
Universities Space Research Association

A dramatic glimpse of the aftermath of a collision between two exoplanets is giving scientists a view at what can happen when planets crash into each other. A similar event in our own solar system may have formed our Moon.

Known as BD +20 307, this double-star system is more than 300 light years from Earth with stars that are at least one billion years old. Yet this mature system has shown signs of swirling dusty debris that is not cold, as would be expected around stars of this age. Rather, the debris is warm, reinforcing that it was made relatively recently by the impact of two planet-sized bodies.

A decade ago, observations of this system by ground observatories and NASA's Spitzer Space Telescope gave the first hints of this collision when the warm debris was first found. Now the Stratospheric Observatory for Infrared Astronomy, SOFIA, revealed the infrared brightness from the debris has increased by more than 10% – a sign that there is now even more warm dust.

Published in the *Astrophysical Journal*, the results further support that an extreme collision between rocky exoplanets may have occurred relatively recently. Collisions like these can change planetary systems. It is believed that a collision between a Mars-sized body and the Earth 4.5 billion years ago created debris that eventually formed the Moon.

“The warm dust around BD +20 307 gives us a glimpse into what catastrophic impacts between rocky exoplanets might be like,” said Maggie Thompson, a graduate student at University of California, Santa Cruz, and the lead author on the paper. “We want to know how this system subsequently evolves after the extreme impact.”

Planets form when dust particles around a young star stick together and grow larger over time. The leftover debris remains after a planetary system forms, often in distant, cold regions like the Kuiper Belt, located beyond Neptune in our own solar system. Astronomers expect to find warm dust around young solar systems. As they evolve, the dust particles continue to collide and eventually become small enough that they are either blown out of a system or pulled into the star. Warm dust around older stars, like our Sun and the two in BD +20 307, should have long since disappeared. Studying the dusty debris around stars not only helps astronomers learn how exoplanet systems evolve, but also builds a more complete picture of our own solar system's history.

“This is a rare opportunity to study catastrophic collisions occurring late in a planetary system's history,” said Alycia Weinberger, staff scientist at the Carnegie Institution for Science's Department of Terrestrial Magnetism in Washington, and lead investigator on the project. “The SOFIA observations show changes in the dusty

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AFRC2019-250-27

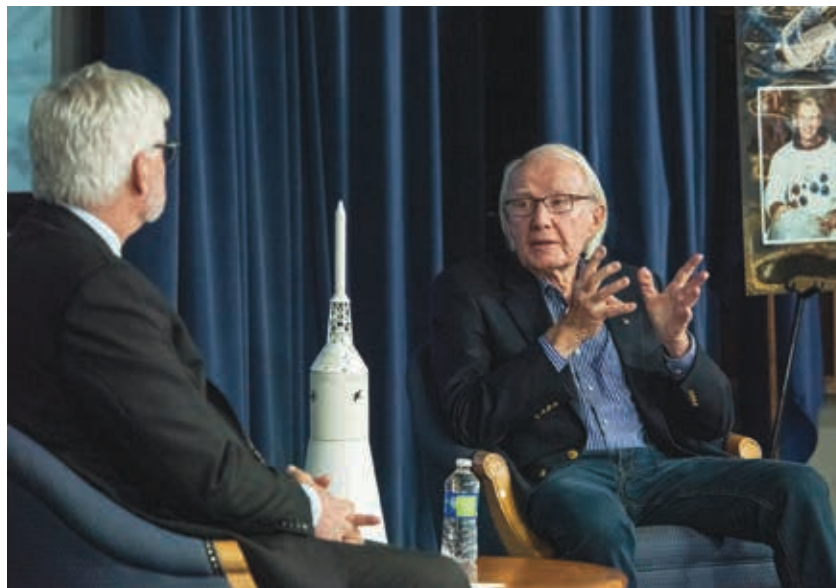
NASA/Lauren Hughes

## Bridenstine sees X-57

NASA Administrator Jim Bridenstine had a firsthand look at the agency's all-electric X-57 Maxwell in its first of three configurations as an electric aircraft, following the vehicle's Oct. 2 delivery to Armstrong. Bridenstine and Deputy Administrator James Morhard were briefed by project managers, pilots, engineers and leadership as he inspected the aircraft in its current configuration called Modification II, or Mod II, which features the replacement of traditional combustion engines with electric motors. The administrator received updates as the team prepares the vehicle for Mod II ground systems testing, to be followed by ground taxi tests and ultimately flight tests.

## Brand recalls space missions

Former NASA astronaut Vance Brand visited Armstrong for a discussion on the Apollo and Space Shuttle programs. Patrick Stoller, AFRC's deputy center director, introduced and interviewed Brand during the event. Brand shared his experience in mission control during the Apollo 13 mission, as an astronaut for the Apollo-Soyuz mission, and commander for three space shuttle missions. He also shared his thoughts on NASA's plan for the Artemis return to the Moon program and on to Mars.



AFRC2019-0244-18

NASA/Ken Ulbrich

## News at NASA

### Loverro is HEO chief

Douglas Loverro is NASA's new associate administrator for the Human Exploration and Operations Mission Directorate. Loverro succeeds former astronaut Kenneth Bowersox who has been acting associate administrator since July.

"I worked with Doug for many years on the Hill and he is a respected strategic leader in civilian and defense programs, overseeing the development and implementation of highly complicated systems," said NASA Administrator Jim Bridenstine who selected him.

For three decades, Loverro was in the U.S. Department of Defense and the National Reconnaissance Office developing, managing and establishing national policy for the full range of National Security space activities.

From 2013 to 2017, he served as the deputy assistant secretary of defense for space policy. In this role, he was responsible for establishing policy for the United States allies to the benefits of space capabilities and to help guide the department's strategy for addressing space-related issues. He led departmental activities in international space cooperation, assessment of the national security impacts of commercial space activities and oversaw the establishment of a strategy for addressing growing challenges in space security.

He earned the Secretary of Defense's Medal for Outstanding Public Service, the Lifetime Achievement Award from the Federation of Galaxy Explorers, and many other honors.





AFRC2019-0242-21 NASA/Lauren Hughes

The X-57 Mod II vehicle arrived Oct. 2 on two semi-trucks. The aircraft's fuselage was on one truck and the wing on the other.



AFRC2019-0242-45 NASA/Lauren Hughes

The X-57 fuselage is carefully unloaded from a semi-truck after delivery to Armstrong.



AFRC2019-0242-33 NASA/Lauren Hughes

The X-57 Mod II wing was delivered to Armstrong Oct 2, as was the fuselage. The two parts were reattached to advance closer toward flight testing.



AFRC2019-0260-17 NASA/Ken Ulbrich

The X-57 Mod II wing is carefully prepared for a lift to position it over the fuselage for reattachment.

# X-57

## Steps to flight advance

By Matt Kamlet  
Armstrong Public Affairs

The first all-electric configuration of NASA's X-57 Maxwell is now at Armstrong.

The X-57, NASA's first all-electric experimental aircraft, or X-plane – and the first crewed X-plane in two decades – was delivered by Empirical Systems Aerospace (ESAero) of San Luis Obispo, California Oct. 2, in the first of three configurations as an all-electric aircraft, known as Modification II, or Mod II.

The X-57's Mod II vehicle features the replacement of traditional combustion engines on a baseline Tecnam P2006T aircraft with electric cruise motors. The delivery is a major milestone for the project, allowing NASA engineers to begin putting the aircraft through ground tests, to be followed by taxi tests and eventually flight tests.

“The X-57 Mod II aircraft delivery to NASA is a significant event marking the beginning of a new phase in this exciting electric X-plane project,” said X-57 Project Manager Tom Rigney. “With the aircraft in our possession, the X-57 team will soon conduct extensive ground testing of the integrated electric propulsion system to ensure the aircraft is airworthy. We plan to rapidly share valuable lessons learned along the way as we progress toward flight testing, helping to inform the growing electric aircraft market.”

The fuselage and wing were separated at Scaled Composites in Mojave, where they had been integrated, and were transported on two semi-trucks



AFRC2019-0260-32 NASA/Ken Ulbrich

The X-57 fuselage is positioned under the Mod II wing section so that it can be reattached. The two major sections were joined at Scaled Composites in Mojave and separated for transport to Armstrong. Reintegration began shortly after the aircraft arrived. The X-57 is intended to help develop certification standards for emerging electric aircraft markets.



AFRC2019-0260-53 NASA/Ken Ulbrich

The X-57 Mod II wing is rejoined with the aircraft's fuselage to begin preparations for reintegration.



AFRC2019-0260-67 NASA/Ken Ulbrich

The X-57 Mod II arrived at Armstrong Oct. 2 and will undergo a number of tests on the ground before beginning flight tests.



# 9-1-1

## Building 703 confined space exercise provided opportunities to test equipment, build familiarity

By Jay Levine

X-Press editor

Emergencies can happen in confined spaces and it's up to responders to be ready for the challenge.

As part of that preparation at Armstrong's Building 703 in Palmdale, the NASA center and U.S. Air Force Plant 42 Fire Department in October orchestrated an effort to refine processes, improve response time and gain experience working together, said Dale McCoy, who works for Armstrong contractor MECX as confined space co-program manager.

Building 703 houses NASA science aircraft such as the ER-2, DC-8 and C-20A, as well as the Stratospheric Observatory for Infrared Astronomy, a NASA 747SP that features the world's largest airborne infrared telescope. The building is located on property leased from the Los Angeles World Airports and shares a runway with them and the adjacent Air Force production plant.

The 37-minute drill began when McCoy saw his partner (in this case a mannequin) disconnected from his harness and collapsed near a fuel supply valve he was cleaning on a 50,000-gallon fuel tank. The valve was in what's called a secondary containment area used to access the valve and collect fuel in the event of a spill or situation where fuel unexpectedly exits the tank.

It was unknown why the man collapsed and there could be an unseen hazard. McCoy could not get to him until the air quality was checked because 70% of



AFRC2019-0248-1 NASA/Lauren Hughes

*A mannequin is used to simulate a worker who has collapsed and come free from a harness intended to extricate the worker in case of emergency as part of a confined spaces training at Armstrong's Building 703 in Palmdale.*



AFRC2019-0248-4 NASA/Lauren Hughes

*Syd Myers, an Armstrong confined space supervisor for a drill at Building 703, called 9-1-1 to begin the exercise. Myers continued to update responders how the situation was evolving until help arrived.*

confined space fatalities are the result of potential rescuers rushing to help and becoming overcome with chemicals or other unknown hazards.

McCoy immediately contacted Syd Myers, who works for MECX as a confined space program co-manager and confined space supervisor in the drill. Myers called

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AFRC2019-0248-08

NASA/Lauren Hughes

*U.S. Air Force Plant 42 Fire Department responder Alfonzo Ortega, reaching, hands Doug Mendez a gas meter to test the air in a confined space during an exercise at Building 703 in Palmdale. Dale McCoy, Armstrong confined space co-program manager, observes.*



AFRC2019-0248-17

NASA/Lauren Hughes

*Syd Myers, an Armstrong confined space supervisor for a drill at Building 703, observes Plant 42 Fire Department responders extract a mannequin from a confined space as part of an emergency exercise.*



AFRC2019-0248-01

NASA/Lauren Hughes

*Plant 42 Fire Department responders carry out the mannequin to an emergency vehicle during an emergency exercise at Building 703. Responders included from left, Kent Courter, Doug Mendez, Alfonzo Ortega, Cedric Willis, Tyler Lippens and Ricky Gimmestad.*

## SOFIA

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disk on a timescale of only a few years.”

Infrared observations, such as those from SOFIA's infrared camera called FORCAST, the Faint Object Infrared Camera for the SOFIA Telescope, are critical for uncovering clues hidden in cosmic dust. When observed with infrared light, this system is much brighter than expected from the stars alone. The extra energy comes from the glow of the dusty debris, which can't be seen at other wavelengths.

While there are several mechanisms that could cause the dust to glow more brightly – it could be absorbing more heat from the stars or moving closer to the stars – these are unlikely to happen in just 10 years, which is lightning fast for cosmic changes. A planetary collision, however, would easily inject a large amount of dust very quickly. This provides more evidence that two exoplanets crashed into each other. The team is analyzing data from follow-up observations to see if there are further changes in the system.

SOFIA is a Boeing 747SP jetliner modified to carry a 106-inch diameter telescope. It is a joint project of NASA and the German Aerospace Center, DLR. NASA's Ames Research Center in California's Silicon Valley manages the SOFIA program, science and mission operations in cooperation with the Universities Space Research Association headquartered in Columbia, Maryland, and the German SOFIA Institute (DSI) at the University of Stuttgart. The aircraft is maintained and operated from Armstrong's Building 703 in Palmdale.

## Haise talks career, Apollo



AFRC2019-268-38

NASA/Ken Ulbrich

*Fred Haise, a former Armstrong test pilot and NASA astronaut, spoke Oct. 30 at the base theater about his career. In the slide behind him is the Apollo 13 crew returning from the aborted Moon mission in 1970. From left in that image are lunar module pilot Haise, mission commander Jim Lovell and command module pilot John Swigert. The tense mission had people around the world concerned until the crew safely returned to Earth. Also at the event, Armstrong Deputy Director Patrick Stoliker spoke about the Artemis mission to land the first woman and the next man on the Moon.*

## Honoring Dennis Hines' advocacy



AFRC2019-0256-01

NASA/Carla Thomas

*Mark Skoog, principal investigator for Autonomy at NASA Armstrong, presents the coin he received as part of the Robert J. Collier Trophy to Connie Hines. The coin was given to Hines in recognition of her husband Dennis Hines, who passed Feb. 1, 2017. Dennis Hines was an advocate for Skoog's work that led to the Automatic Ground Collision Avoidance System. A variant of that system has saved at least eight lives in military jets and was a key part of the Collier Trophy nomination.*



## X-57... from page 4

to Armstrong. Shortly following the arrival, the sections were unloaded and unwrapped, and crews began integration to reunite the wing with the fuselage.

While X-57's Mod II vehicle begins systems validation testing on the ground, preparation for the project's following phases, Mods III and IV, are underway. For example, loads testing on the new, high-aspect-ratio wing concluded in September at NASA Armstrong's Flight Loads Laboratory. The wing, which will be featured on the Mods III and IV configurations, will be undergoing fit checks on a

fuselage at ESAero, ensuring timely transition from the project's Mod II phase to Mod III.

"ESAero is thrilled to be delivering the MOD II X-57 Maxwell to NASA AFRC," said ESAero President and CEO Andrew Gibson. "In this revolutionary time, the experience and lessons learned from early requirements to current standards development, has the X-57 paving the way. This milestone, along with receiving the successfully load-tested MOD III wing back, will enable NASA, ESAero and the small business team to accelerate and lead electric

air vehicle distributed propulsion development on the MOD III and MOD IV configurations with integration at our facilities in San Luis Obispo."

A goal of the X-57 project is to help develop certification standards for emerging electric aircraft markets, including urban air mobility vehicles, which also rely on complex distributed electric propulsion systems. NASA will share the aircraft's electric-propulsion-focused design and airworthiness process with regulators and industry, which will advance certification approaches

for aircraft utilizing distributed electric propulsion.

The X-57 team is using a "design driver" as a technical challenge to drive lessons learned and best practices. This design driver includes a 500% increase in high-speed cruise efficiency, zero in-flight carbon emissions, and flight that is much quieter for communities on the ground.

The X-57 project operates under the Integrated Aviation Systems Program's Flight Demonstrations and Capabilities project, within NASA's Aeronautics Research Mission Directorate.

## Exercise... from page 6

9-1-1 and continued to update responders regarding how the situation was evolving until help arrived. Responders had to use multi-gas detection meters to test the air because isopropyl alcohol was used to clean the fuel valve. It could be hazardous in heavy concentration.

Once it was determined there wasn't an airborne threat, rescuers attached the mannequin to its safety harness for extraction from the bottom of the access area that has six-foot tall walls.

"Close coordination with all of the emergency responders is vital for continual process improvement in the event there is an emergency," McCoy said. "There are so many

moving parts in an emergency and in this drill that included a number of Armstrong organizations to allow the exercise to unfold without complicating day-to-day operations."

The exercise also had another purpose.

"We recently purchased some new rescue equipment for this exact type of emergency," he said. "A rescue winch is attached to the entrants harness for a quick extraction in case a situation unfolds like the one in the exercise."

Air Force Plant 42 responders said the new equipment saved at least an hour and simplified getting to the injured person, as

they would have to piece together equipment for that job otherwise, said Myers.

"This was a chance for us to demonstrate the equipment and train with Air Force Plant 42 Fire Department rescuers on how to use it," Myers said.

The four months of planning, coordination and preparation made the exercise a success, McCoy said. Such exercises are annual at Building 703 and main base on Edwards to keep responders sharp.

"It was fantastic," McCoy said. "There are always areas for improvement, but that's why we do it. We take those lessons learned and gained some

familiarization with the new equipment and experience working with the responders."

"It also was an opportunity to use our checklists and it was the first chance for some responders to learn on the fly the necessary calls and helped us learn in case of an actual event what we have to do, refine our procedures and share best practices," Myers added.

In an actual emergency, McCoy explained, Plant 42 personnel would respond if the incident were aircraft or fuel tank related, while L.A. County responders would lead in an emergency such as a facility related confined space, depending on location and the nature of the emergency.

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