AEROSPACE

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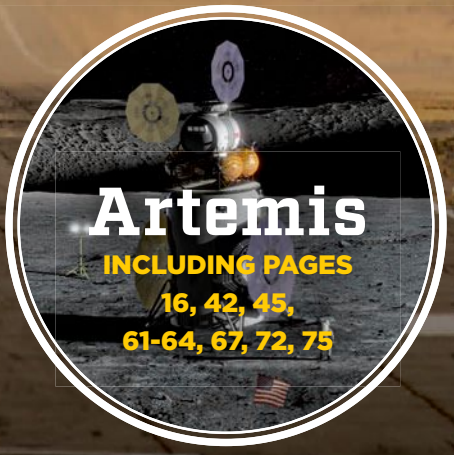
2019

YEAR IN REVIEW



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SHAPING THE FUTURE OF AEROSPACE

Novel designs and NASA's moon-to-Mars goals inspire next generation

BY LISA SAAM

The **Design Engineering Committee** promotes the development and dissemination of technologies that assist design engineers in defining practical aerospace products.

▲ **A bird-of-prey-inspired** design that Airbus says will motivate the next generation of aeronautical engineers to create sustainable aircraft.
Airbus

Airbus in July released the conceptual design for a new airliner that it said would push the boundaries of technology and innovation with its birdlike appearance. Revealed on the opening day of the Royal International Air Tattoo air show in the United Kingdom, the design was dubbed the **Bird of Prey** due to its wing and tail structures that mimic those of an eagle or falcon. Other unique design features include moveable wingtips inspired by feathers, a **next-generation hybrid electric propulsion** system, distributed propulsion and components that would be 3D-printed from state-of-the-art materials. Subscale technology demonstrators could incorporate elements of this concept, but the main goal was to inspire the next generation of aeronautical engineers to help create sustainable and greener aircraft.

In the space realm, NASA made several awards in May with the objective of achieving a human lunar landing by 2024. Maxar Technologies of Colorado received a contract from NASA to design the **Power and Propulsion Element** of NASA's lunar Gateway. The PPE will be a solar electric propulsion spacecraft that will also serve as a communication relay for the **Gateway**.

Also, 11 companies in eight states were awarded contracts under NASA's **Next Space Technologies for Exploration Partnerships**. The awardees will conduct studies or produce prototypes of potential human landing spacecraft, with a focus on descent, transfer and refueling. The transfer portion will carry astronauts from the Gateway to low-lunar orbit. The descent portion will transport them from

▶ **SpaceX's DEMO-1 Crew Dragon** autonomously docked with the International Space Station in a first for a U.S. commercial spacecraft. The spacecraft is shown in the hangar at Launch Complex 39A in Florida.
SpaceX

low-lunar orbit to the surface. Refueling capabilities are required for the elements of the landing system to be reusable.

NASA conducted ground testing on **five full-size prototypes of deep-space habitation modules**. The testing began in March and lasted several months. The prototypes were made by Bigelow Aerospace of Nevada, Boeing, Lockheed Martin, Northrop Grumman, and Sierra Nevada Corp. of Colorado between 2016 and 2018. During the ground testing, NASA evaluated human factors such as how astronauts would live and work in the Gateway and the ergonomics and capabilities of each habitat. A major objective of the prototype testing was to produce a refined set of design requirements for deep-space habitation modules.

In March, a **SpaceX Crew Dragon** docked autonomously with the International Space Station in a demonstration mission, called **DEMO-1**, without a crew aboard. The docking was the **first by an American commercial spacecraft at ISS** and the first space launch under NASA's **Commercial Crew Program**. Crew Dragon leverages the flight heritage of Dragon, which completed 16 cargo missions to and from ISS prior to the DEMO-1 mission. Crew Dragon consists of a pressurized capsule with environmental control and life support equipment capable of carrying up to seven passengers and an unpressurized trunk for cargo.

In the small satellite launcher market, Virgin Orbit of California in July conducted the first drop test of its **LauncherOne rocket**, a milestone toward its first orbital launch. In the test, an inert LauncherOne was dropped from the Cosmic Girl carrier aircraft, a modified Boeing 747, over the test range at Edwards Air Force Base in California's Mojave Desert. For a space launch, Cosmic Girl will carry a LauncherOne rocket to an altitude above 30,000 feet and release it to boost small satellites to orbit. ★