

Ground Systems Development and Operations

The Ground Systems Development and Operations Program (GSDO) is one of three NASA programs based at NASA's Kennedy Space Center in Florida, including the Launch Services and the Commercial Crew programs. GSDO was established to develop and operate the systems and facilities necessary to process and launch rockets and spacecraft during assembly, transport and launch.

GSDO's mission is to transform the center from a historically government-only launch complex to a spaceport that can handle several different kinds of spacecraft and rockets and NASA's exploration objectives by developing the necessary ground systems, infrastructure and operational approaches.

Unlike previous work focusing on a single kind of launch vehicle, such as the Saturn V or space shuttle, engineers and managers in GSDO are preparing infrastructure to support several different kinds of spacecraft and rockets that are in development, including NASA's Space Launch System (SLS) rocket and Orion spacecraft for Exploration Mission-1 (EM-1).

A key aspect of the program's approach to long-term sustainability and affordability is to make processing and launch infrastructure available to commercial and other government customers, thereby distributing the cost among multiple users and reducing the cost of access to space.

NASA is developing the SLS heavy-lift booster and working with several private companies to produce rockets and spacecraft to take astronauts to low-Earth orbit and the International Space Station. The SLS is set to be the most powerful U.S. rocket since the Saturn V took astronauts to the moon and will act as the cornerstone for NASA's future human exploration missions to deep space destinations.

Working closely with those developmental projects, GSDO is overseeing efforts to utilize a catalog of spaceflight facilities at Kennedy. Some of the facilities already are being refurbished and modified for future use, most noticeably Launch Pad 39B.



High up in the Vehicle Assembly Building (VAB) at NASA's Kennedy Space Center in Florida, an overhead crane lowered the final work platform, A north, into place for installation in High Bay 3 on Jan. 12, 2017. The installation of the final topmost level completes the 10 levels of work platforms, 20 platform halves altogether, that will surround NASA's Space Launch System (SLS) rocket and the Orion spacecraft and allow access during processing for missions, including the first uncrewed flight test of Orion atop the SLS rocket in 2018. Photo credit: NASA/Frank Michaux

The launch pad hosted space shuttle launches throughout that program's 30 years, but its shuttle-specific facilities have been removed to allow several different kinds of rockets to lift off from the pad.

Also in support of the SLS, the crawler-transporter, Vehicle Assembly Building (VAB), Launch Control Center's Young-Crippen Firing Room 1 and mobile launcher (ML) are undergoing modifications for their new roles.

The Orion Multi-Purpose Crew Vehicle that will carry crew members aboard the SLS will be processed in Kennedy's refurbished Neil Armstrong Operations and Checkout (O&C) building. The state of Florida provided \$35 million for refurbishment of the O&C high bay. The facility is fully operational and certified



NASA's upgraded crawler-transporter 2 (CT-2), carrying mobile launcher platform 1, moves slowly along the crawlerway March 22, 2017, at Kennedy Space Center in Florida. The crawler's upgrades and modifications were monitored and tested under loaded conditions during its travel to the crawlerway Pad A/B split and back to the crawler yard to confirm it is ready to support the load of the mobile launcher carrying the Space Launch System with Orion atop for the first uncrewed test flight, Exploration Mission-1.
Photo credit: NASA/Leif Heimbald

and was used for final assembly, testing and checkout of Orion for Exploration Flight Test-1. The high bay is now being used to process and prepare the Orion spacecraft for EM-1.

GSDO is focusing on the equipment, management and operations required to safely connect a spacecraft with a rocket, move the launch vehicle to the launch pad and successfully launch it into space. The work entails use of many of the facilities unique to Kennedy, such as the 52-story VAB and Launch Pad 39B.

Work is in progress to modify the ML to accommodate the SLS. The ML is a platform and tower designed to support the SLS rocket and Orion spacecraft and position umbilicals to the craft, including a walkway astronauts will use to board the Orion spacecraft.

Inside the VAB, High Bay 3 was emptied of its space shuttle-era work platforms and support equipment. A total of 10 levels of new work platforms -- 20 platforms altogether -- have been installed. They will surround the rocket and spacecraft and provide access for testing and processing. The platforms will move in and out, and translate up and down on rails as needed to accommodate different configurations of the SLS and potentially other government and commercial vehicles.

MORE INFORMATION ONLINE

For more information on the Ground Systems Development and Operations Program, go to <http://www.nasa.gov/groundsystems>

The crawler-transporters (CTs) that carried the Saturn V rockets and space shuttles to the launch pad also will carry the next generation of launch vehicles and spacecraft to the launch pads. The CTs have been operational since 1966. One of the transporters has been upgraded and strengthened to support the increased weight of the SLS and Orion spacecraft.

GSDO is developing ways to process the Orion spacecraft, rocket stages and launch abort system before they are all assembled into one vehicle. The work will take place in several facilities in Kennedy's industrial area, including the O&C, the Multi-Payload Processing Facility, the Launch Abort System Processing Facility and others. The buildings were built specifically for the demanding processing work involved with preparing spacecraft for flight. Such preparations can include software loading, final assembly and the loading of chemicals and propellants, depending on the spacecraft.

Also, the command, control, communications and range systems are being modernized. In addition to bringing computers, tracking systems and other networks up to date, GSDO is creating systems that can handle several different kinds of spacecraft and rockets. The computers, antennas and software are expected to reduce the need for a large launch team.

Kennedy has more than 50-years serving as our nation's gateway to exploring the universe. Taking the knowledge and assets of NASA's successful spacefaring past, the GSDO Program is helping to build a successful and diverse future in spaceflight.



Cranes lower large segments of the support hardware for a new flame deflector into place in the flame trench July 21, 2017, at Launch Pad 39B at NASA's Kennedy Space Center in Florida. The new flame deflector will be positioned about six feet south of the shuttle-era flame deflector's position. During liftoff of NASA's Space Launch System, the rocket's flame and energy will be diverted to the north side of the flame trench.
Photo credit: NASA/Kim Shiflett

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