

Private Spacewalks: The Groundbreaking Polaris Dawn Mission

The upcoming Polaris Dawn mission, slated to launch no earlier than August 26, 2024, from NASA's Kennedy Space Center, marks a historic moment in private space exploration. Led by billionaire Jared Isaacman, the mission is part of the larger Polaris Program, a multi-flight initiative designed to push the boundaries of private spaceflight. While the world watches the progress of government-funded space agencies like NASA, Isaacman's mission ventures into new territories, advancing technology and attempting feats never before carried out by non-government astronauts, such as the first all-civilian spacewalk.



[Source: Business Today]

The Genesis of Polaris Dawn

Polaris Dawn is the second private SpaceX mission under Isaacman's leadership, following the successful Inspiration4 flight in 2021. Inspiration4 made history as the first civilian-only space mission, raising \$250 million for St. Jude Children's Research Hospital. Polaris Dawn, however, carries even loftier goals: Isaacman envisions the mission as a way to pioneer private spaceflight and accelerate the development of new space technologies. This mission is particularly ambitious because it aims to push human space travel farther from Earth than any manned flight in over 50 years, setting a new standard for private space ventures.

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The Polaris Program, as a whole, is Isaacman's attempt to blend philanthropy, scientific research, and space exploration. With each mission, the objectives become more challenging, moving beyond simply reaching orbit to advancing technological milestones that will be critical for future space missions. For Isaacman, the Polaris Program is as much about scientific discovery as it is about preparing humanity for long-duration missions to the Moon, Mars, and beyond.

The Crew and Their Mission

The crew for Polaris Dawn is an eclectic mix of professionals with diverse backgrounds, all aligned with the mission's high-stakes goals. Jared Isaacman, the mission's commander, is no stranger to high-pressure situations. As the founder of the payment services company Shift4 and a seasoned jet pilot, Isaacman has long held dreams of space travel. His co-pilot, Scott "Kidd" Poteet, is a retired United States Air Force Lieutenant Colonel with extensive experience flying fighter jets, including over 1,400 hours in flight combat simulators.

The remaining two crew members, Sarah Gillis and Anna Menon, both SpaceX Lead Space Operations Engineers, will serve as mission specialists. Menon will also act as the crew's medical officer. Not only are they key SpaceX employees, but they are also among the first employees to launch into space on one of their employer's rockets. This mix of military precision, corporate innovation, and advanced engineering expertise provides the Polaris Dawn crew with the ideal skills to undertake the mission's complex objectives.

Key Scientific Objectives



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[Source: CNN]

The Polaris Dawn mission has ambitious scientific and technological goals. The crew will be tasked with conducting around 40 different experiments, with a focus on areas such as human physiology, space communication, and space environment interactions. The mission will also fly in an elliptical orbit that will take the crew to altitudes of around 870 miles (1,400 kilometers) above Earth, the highest any human has traveled since the final Apollo mission in 1972. This higher altitude provides a unique opportunity to study radiation exposure and the impact of long-duration space travel on the human body.

One of the most intriguing experiments involves testing SpaceX's laser-communication technology using its Starlink satellite network. This test is expected to demonstrate the ability to transmit data between the spacecraft and Earth at extremely high speeds. Sarah Gillis, one of the mission specialists, will be directly involved in this development effort and has teased that the crew will send a "special message" to Earth using the laser communication technology.

The First Private Spacewalk

Perhaps the most groundbreaking aspect of Polaris Dawn is its planned all-civilian spacewalk. This will be the first time that astronauts who are not part of a government space agency will venture outside a spacecraft and into the vacuum of space. The crew will test SpaceX's new Extra-Vehicular Activity (EVA) suits, which are a more advanced version of the suits designed for intra-vehicular use. These suits must withstand the harsh conditions of outer space, including extreme temperatures, radiation, and microgravity.

The EVA suits are designed to be both protective and functional, featuring advanced thermal management systems, heads-up displays, and high-definition cameras. The success of this spacewalk could pave the way for future commercial space missions and even lunar or Martian excursions. The crew will follow a meticulous process, including a two-day "pre-breathe" protocol to prevent decompression sickness, before two of the crew members—likely Isaacman and Gillis—exit the spacecraft.

Overcoming Technical Challenges

In preparation for the mission, the Polaris Dawn crew underwent rigorous training over the past two years. Their regimen included endurance exercises like mountain climbing and skydiving, as well as team-building exercises. The crew also participated in high-G jet flights to simulate the conditions they will face in space. This extensive preparation is necessary given the unique challenges the crew will face, from surviving the radiation of the Van Allen belts to executing complex tasks outside the spacecraft.

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One of the most critical challenges has been ensuring the spacecraft can survive the harsh conditions it will encounter. SpaceX engineers have put the Crew Dragon through rigorous tests, even exposing the avionics—electronic systems used for navigation and communication—to radiation levels similar to those the crew will encounter. In an innovative experiment, SpaceX took these systems to an oncology lab, bombarding them with radiation to understand their breaking points. Additionally, SpaceX implemented automatic rebooting software to ensure that any malfunctions caused by radiation can be quickly addressed.

A New Frontier in Space Travel



[Source: Space.com]

Polaris Dawn is more than just a private mission to space; it represents a new frontier in space exploration. With private individuals venturing further into space than ever before, the mission sets a new benchmark for what non-governmental organizations and companies can achieve in the realm of space exploration. The technology being tested during this mission—from advanced EVA suits to laser communication systems—will likely play a crucial role in future missions to the Moon, Mars, and beyond.

Jared Isaacman's decision to fund and lead these missions demonstrates the growing influence of private sector funding and innovation in space travel. While government agencies like NASA and ESA continue to play a critical role in space exploration, missions like Polaris Dawn highlight the increasing potential of private-public partnerships in pushing the boundaries of human spaceflight.

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Risks and Rewards

Despite its groundbreaking goals, Polaris Dawn comes with significant risks. Any spacewalk is dangerous, and performing one without the traditional safety net of a government agency's infrastructure raises the stakes even higher. The crew will be exposed to higher levels of radiation than typical space missions due to the mission's high orbit, which could lead to unforeseen complications.

Even the EVA suits represent a high-risk, high-reward element of the mission. While SpaceX has rigorously tested the suits, this will be the first time they are used in a real-world environment. The suits lack a Primary Life Support System (PLSS), which means the astronauts will be tethered to the spacecraft for life support. This approach allows for a simpler design but also introduces new challenges that have never been faced by NASA astronauts during spacewalks.

Garrett Reisman, a former NASA astronaut and SpaceX consultant, acknowledges the risks but believes they are mitigated by SpaceX's testing protocols. The company has a history of pushing the envelope, conducting rapid development cycles while ensuring safety through extensive ground testing. Still, the mission's success is far from guaranteed, and many challenges will need to be addressed in real-time during the mission.

The Future of the Polaris Program

Polaris Dawn is just the first of three planned missions under the Polaris Program, with each subsequent mission building on the success and lessons of the previous one. While details about the next two missions are still under development, Isaacman has indicated that the third mission will be the first crewed flight of SpaceX's Starship, a spacecraft designed for long-duration missions to the Moon and Mars.

This ambitious roadmap highlights the growing potential for private companies to lead space exploration efforts. As Isaacman continues to fund and participate in these missions, the boundaries of what private individuals can achieve in space will continue to expand. The Polaris Program is not just a series of spaceflights; it is an essential step toward humanity's long-term goal of becoming a multi-planetary species.

Polaris Dawn is a pioneering mission that represents the convergence of private ambition, cutting-edge technology, and scientific exploration. Led by Jared Isaacman, the mission is a bold attempt to push the boundaries of what private individuals can achieve in space, from venturing farther into space than any humans have in decades to conducting the first all-civilian spacewalk. The risks are substantial, but so are the potential rewards. As private space exploration continues to grow, missions like Polaris Dawn will play a crucial role in preparing humanity for future missions to the Moon, Mars, and beyond.