POLAND IN SPACE

SŁAWOSZ UZNAŃSKI-WIŚNIEWSKI JOINED THE EUROPEAN SPACE AGENCY (ESA) AS A PROJECT ASTRONAUT IN SEPTEMBER 2023. ASSIGNED TO AXIOM MISSION 4 (AX-4), HE PLAYED A CENTRAL ROLE IN **THE IGNIS MISSION – POLAND'S FIRST MISSION TO THE INTERNATIONAL SPACE STATION –** WHICH TOOK PLACE FROM JUNE TO JULY 2025.

SPONSORED BY THE POLISH GOVERNMENT AND SUPPORTED BY ESA, THE MINISTRY OF ECONOMIC DEVELOPMENT AND TECHNOLOGY (*MRIT*), AND THE POLISH SPACE AGENCY (*POLSA*), THE MISSION FEATURED AN **AMBITIOUS TECHNOLOGICAL AND SCIENTIFIC PROGRAMME**, INCLUDING SEVERAL EXPERIMENTS PROPOSED BY THE POLISH SPACE INDUSTRY.

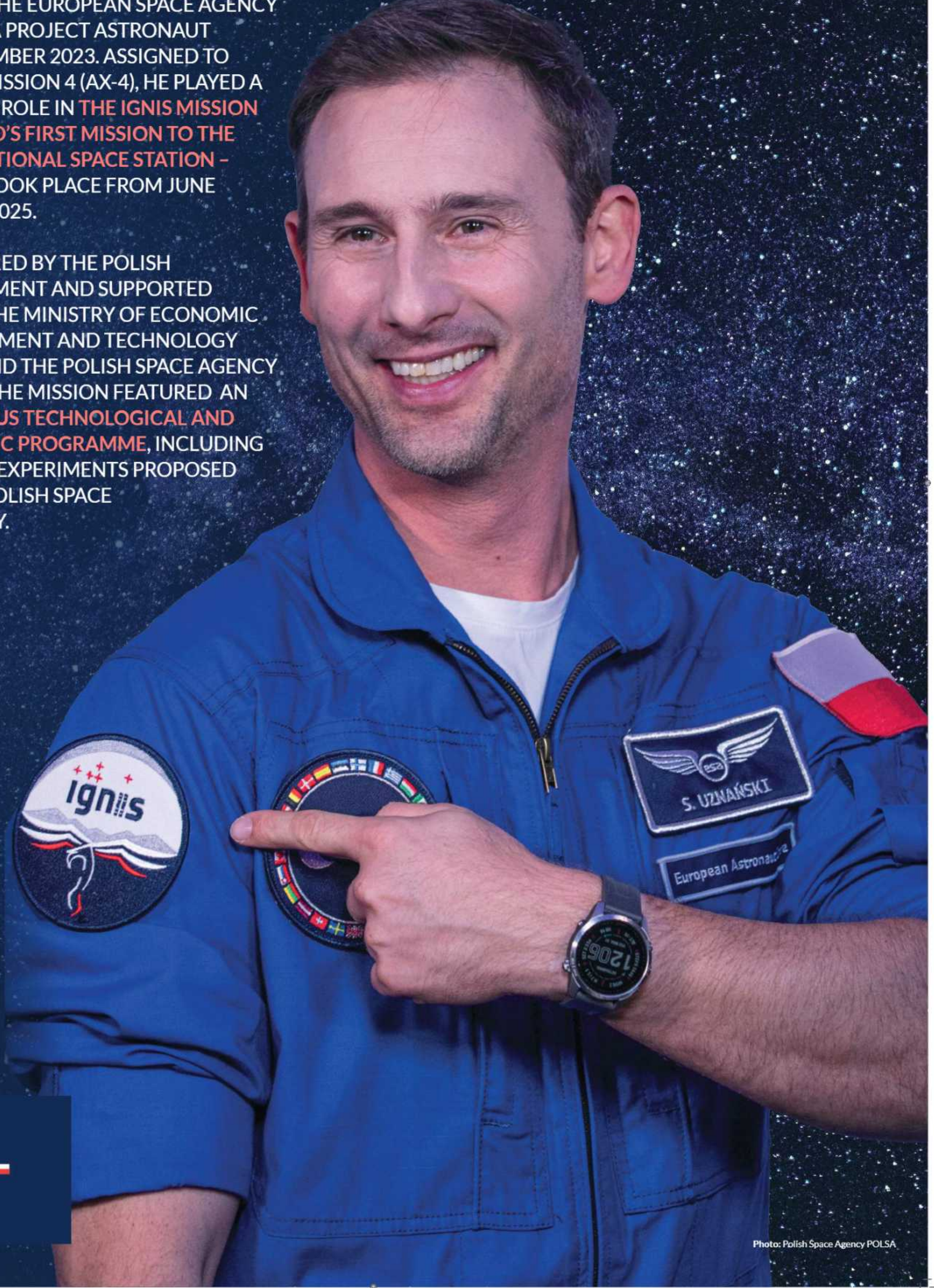

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Photo: Polish Space Agency POLSA

THE IGNIS MISSION

AS A PART OF **AXIOM MISSION 4** (AX-4), INCLUDED A PROGRAMME OF INNOVATIVE RESEARCH IN **MICROGRAVITY** AND EDUCATIONAL OUTREACH. EXPERIMENTS PROPOSED BY THE POLISH SPACE INDUSTRY AND DEVELOPED UNDER ESA'S LEADERSHIP SHOWCASE **POLAND'S GROWING CONTRIBUTION** TO INTERNATIONAL SPACE EXPLORATION.

Ministry of Economic Development and Technology
Republic of Poland

POLSA

esa
THE EUROPEAN SPACE AGENCY

Ignis mission science and technology

Human Research

EEG Neurofeedback | Academy of Physical Education and Sport in Gdańsk
Stress in space can hinder performance. This experiment will test how stimulating brain waves through EEG neurofeedback can reduce stress, helping astronauts stay focused and efficient in challenging conditions. The results could be applied to any high-pressure environment on Earth.

Wireless Acoustics | Swortex
This experiment tests new wireless mass measurement methods to ensure astronaut safety and comfort. It integrates sound monitoring and personal dosimetry with the medical system on board the Space Station, enhancing crew wellbeing.

Human Gut Microbiota
Military University of Technology (WAT)
What happens to the beneficial bacteria in the human gut during space travel?
This research examines how a short stay in orbit affects the microbiome, shedding light on the impact of radiation, microgravity and stress on digestive health.

Immuno Multiomics
Military University of Technology (WAT)
To better protect astronauts during future missions, scientists are analysing how immune cells respond to space conditions. By studying gene expression and DNA methylation before, during and after missions to the Space Station, they aim to uncover critical insights into immune system adaptation.

Multi Textus (AstroPerformance)
Smarter Diagnostics
In space, weightlessness causes muscle and tendon weakening. This experiment will track these changes in the astronaut's legs using MRI, blood tests, and movement tasks, with results compared to Earth-based volunteers, aiming to enhance physiotherapy as well as AI-driven diagnostic methods for processes physical performance and limit recovery.

AstroMentalHealth | University of Silesia
This project observes astronauts' mental well-being during their time in space, comparing it with results from the same research procedures conducted on Earth. By tracking daily activities, conducting psychological assessments, and reviewing personal diaries and photos, scientists aim to identify patterns in mental functioning, ensuring astronauts receive support at critical moments of the mission.

PhotonGrav | Gravitation
Using near-infrared spectroscopy, this study explores controlling computers in space via brain activity alone, without muscle involvement. It aims to monitor attention and logical errors, offering promising applications for future space missions.

Technology Demonstrations

LeopardSS | EP Labs
LeopardSS is a data processing platform on the International Space Station that tests artificial intelligence (AI) technology in space conditions. It helps develop smarter, more autonomous systems for future missions, supporting applications like rover navigation, 3D mapping, and exploration of difficult terrain on other planets. By making AI testing more accessible, this project helps open space technology to more people and organisations.

RadMax-on-ISS | SignalCom
The Scalable Radiation Monitor measures the radiation levels in space and how it affects the chips (small electronic circuits) that operate onboard satellites and space station systems. The data collected will help develop electronic systems that can adapt to the harsh radiation of space, ensuring they work and process data reliably for future missions.

Material Science

MXene in LEO
AGH University of Science and Technology
This experiment tests the stability of the nanomaterial MXene in space conditions and evaluates its potential in wearable tech. A wristband with an MXene sensor will monitor heart rate, offering insights into its application for future space missions.

Biotechnology

Space Volcanic Algae | Extremo Technologies
This study focuses on extremophilic microalgae from volcanic regions, testing their ability to survive and adapt to space conditions. These algae could help support future space missions by being used in closed-loop systems and space medicine. Researchers will also test a new oxygen sensor to measure photosynthesis in space, contributing to advancements in sustainable space missions and improving the ability to monitor oxygen production in space environments.

Stability of Drugs | Centre for Polymer and Carbon Materials of the Polish Academy of Sciences
To ensure astronauts have reliable medicines during long missions, this experiment examines whether dosing drugs in a polymer carrier can extend their shelf life. By testing popular medicines on the ISS, the study addresses the challenge of medical resupply in remote environments like the Moon.

Yeast TardigradeGene | University of Szczecin
This experiment tests whether yeast enriched with tardigrade protein can survive space's harsh conditions, including radiation and microgravity. The goal is to explore its potential for producing food and biofuel on long-term missions, offering a sustainable solution for space exploration.

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Photo: ©ESA

COLUMBUS SYSTEMS TRAINING

SŁAWOSZ UZNAŃSKI-WIŚNIEWSKI **COMPLETED COLUMBUS SYSTEMS TRAINING** AT USER, OPERATOR, AND SPECIALIST LEVELS AT ESA'S EUROPEAN ASTRONAUT CENTRE, BECOMING A **FULLY QUALIFIED COLUMBUS SPECIALIST**. COLUMBUS IS EUROPE'S LABORATORY ABOARD THE INTERNATIONAL SPACE STATION (ISS), SUPPORTING SCIENTIFIC RESEARCH ACROSS VARIOUS FIELDS, INCLUDING BIOLOGY, PHYSIOLOGY, AND FLUID SCIENCE. THIS TRAINING PREPARED HIM FOR HIS ROLE AS **MISSION SPECIALIST ON AXIOM MISSION 4** (AX-4).

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Photo: ©ESA

AXIOM MISSION 4

WAVE-OFF EVENT

ON 6 JUNE 2025, **SŁAWOSZ UZNAŃSKI-WIŚNIEWSKI** ATTENDED THE AXIOM MISSION 4 WAVE-OFF EVENT IN MELBOURNE, FLORIDA, TOGETHER WITH HIS CREWMATES: PILOT SHUBHANSHU SHUKLA FROM INDIA AND MISSION SPECIALIST TIBOR KAPU FROM HUNGARY. THE MISSION WAS COMMANDED BY PEGGY WHITSON, AXIOM SPACE'S DIRECTOR OF HUMAN SPACEFLIGHT AND FORMER NASA ASTRONAUT.

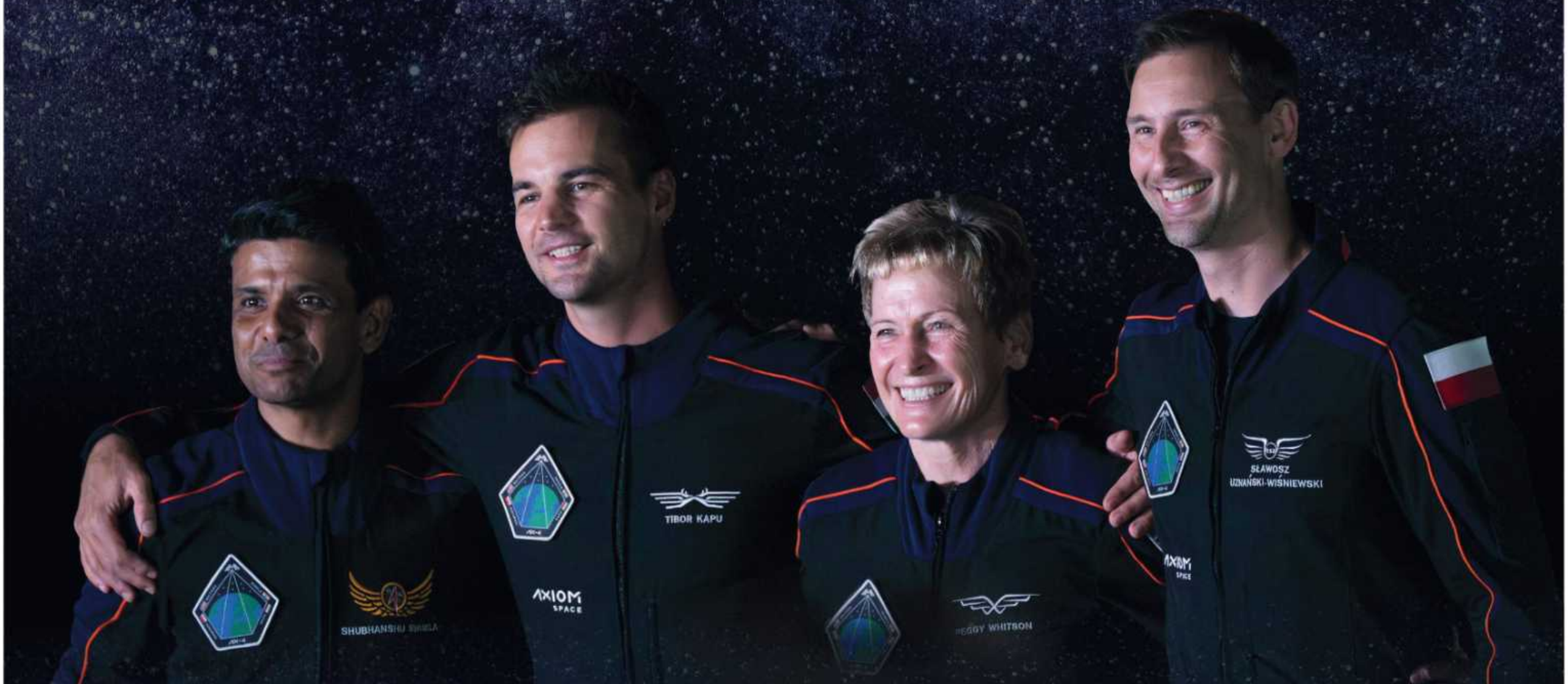

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Photo: ©ESA - S. Corvaja

FALCON 9

THE AXIOM MISSION 4 (AX-4) CREW LIFTED OFF TO THE INTERNATIONAL SPACE STATION ATOP A SPACEX FALCON 9 ROCKET FROM LAUNCH PAD 39A AT NASA'S KENNEDY SPACE CENTER IN FLORIDA, USA, ON 25 JUNE AT 02:31 EDT (07:31 BST / 08:31 CEST). ESA PROJECT ASTRONAUT SŁAWOSZ UZNAŃSKI-WIŚNIEWSKI BEGAN HIS JOURNEY TO HIS NEW HOME IN SPACE ABOARD THE DRAGON SPACECRAFT.

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INTERNATIONAL SPACE STATION

SŁAWOSZ UZNAŃSKI-WIŚNIEWSKI AND HIS CREWMATES REACHED THE INTERNATIONAL SPACE STATION APPROXIMATELY **28 HOURS** AFTER LAUNCH. THE POLISH PART OF THE AX-4 MISSION, KNOWN AS IGNIS, OFFICIALLY BEGAN ONCE SŁAWOSZ ENTERED THE STATION. **IGNIS WAS POLAND'S FIRST GOVERNMENT-SPONSORED HUMAN SPACEFLIGHT MISSION TO THE INTERNATIONAL SPACE STATION.**

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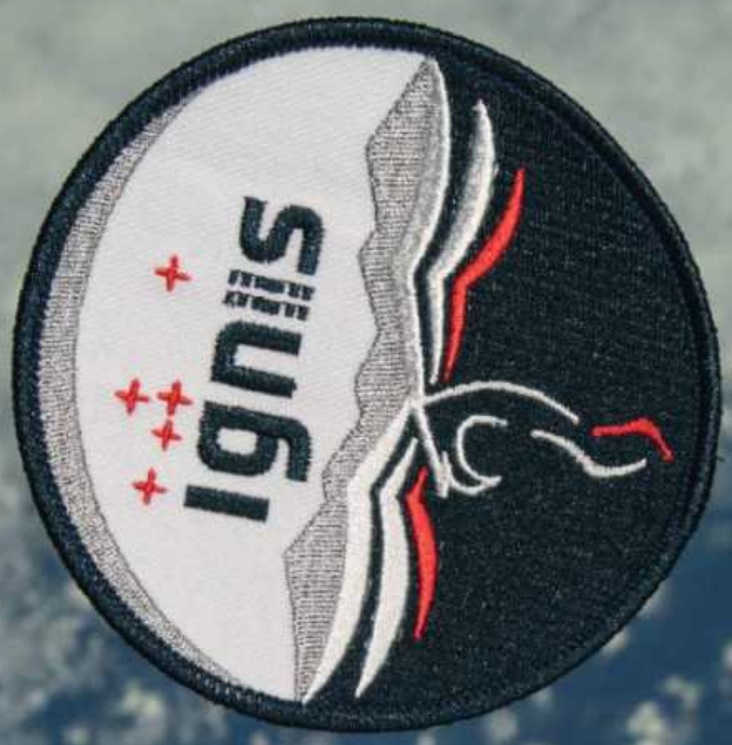
Photo: ©ESA - S. Uznański-Wiśniewski



IGNIS

SYMBOL OF A NEW POLISH SPACE AGE

THE **IGNIS PATCH** FLOATS INSIDE THE EUROPEAN-BUILT, SEVEN-WINDOWED CUPOLA, WITH EARTH AS A BACKDROP. NAMED AFTER THE LATIN WORD FOR **'FIRE,'** IGNIS **SYMBOLIZES** THE SPARK OF A **NEW ERA IN POLAND'S SPACE EXPLORATION**. THE MISSION PATCH REFLECTS THIS AMBITION, FEATURING A **RED AND WHITE EAGLE** WITH WINGS INSPIRED BY THE **ORLA PERĆ** MOUNTAIN RANGE, STARS FORMING THE **SCUTUM CONSTELLATION**, AND A **SILVER HORIZON** REPRESENTING THE DAWN OF THIS NEW ERA IN SPACE EXPLORATION.

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13 POLISH EXPERIMENTS

REACH SPACE

DURING THE IGNIS MISSION, SŁAWOSZ UZNAŃSKI-WIŚNIEWSKI CONDUCTED **13 EXPERIMENTS** PROPOSED **BY POLISH COMPANIES AND INSTITUTIONS** AND DEVELOPED IN COLLABORATION WITH ESA, ALONG WITH **THREE ADDITIONAL ESA-LED EXPERIMENTS**. THESE COVERED A BROAD RANGE OF FIELDS, INCLUDING HUMAN RESEARCH, MATERIALS SCIENCE, BIOLOGY, BIOTECHNOLOGY, AND TECHNOLOGY DEMONSTRATION. ONE OF THE EXPERIMENTS INVESTIGATED **THE PHYSIOLOGICAL RESPONSES OF SPACE VOLCANIC ALGAE TO MICROGRAVITY AND COSMIC RADIATION.** THIS EXPERIMENT REPRESENTS A STEP TOWARDS DEVELOPING SUSTAINABLE SYSTEMS FOR LIVING IN SPACE AND ENABLING SURVIVAL UNDER EXTREME TERRESTRIAL CONDITIONS SUCH AS HIGH CONCENTRATIONS OF METALS, ACIDITY, AND RADIATION.

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A TASTE OF POLAND
ON THE ISS

SŁAWOSZ UZNAŃSKI-WIŚNIEWSKI IS ABOUT TO TAKE A **BITE OF THE FIRST-EVER BATCH OF PIEROGI** PREPARED IN SPACE DURING THE IGNIS MISSION. THE TRADITIONAL POLISH DUMPLING FLOATS IN THE INTERNATIONAL SPACE STATION'S WINDOW TO THE WORLD – THE EUROPEAN-BUILT CUPOLA. IN A FIRST FOR SPACE CUISINE, SŁAWOSZ BROUGHT A TASTE OF HOME TO ORBIT. **PIEROGI HAVE BEEN PART OF POLISH CUISINE SINCE THE 13TH CENTURY AND REMAIN A STAPLE OF POLISH HOME COOKING.**

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Photo: ©ESA - S. Uznański-Wiśniewski

LESSON FROM SPACE

SŁAWOSZ UZNAŃSKI-WIŚNIEWSKI DURING AN EDUCATIONAL RECORDING ON THE INTERNATIONAL SPACE STATION.

THIS SHOT IS PART OF THE NEWTON'S CRADLE ACTIVITY, IN WHICH SŁAWOSZ CONDUCTED A VIDEO DEMONSTRATION OF NEWTONIAN PHYSICS. **THE CRADLE WAS CRAFTED TO PRECISE SPECIFICATIONS BY VOCATIONAL STUDENTS STUDYING METALWORKING IN POLAND.** IT HELPS DEMONSTRATE HOW VOCATIONAL SKILLS CONTRIBUTE VALUE TO THE AEROSPACE INDUSTRY.

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A CLASSROOM IN ORBIT

SŁAWOSZ BECAME A BRIDGE BETWEEN ORBIT AND EARTH, RECORDING EDUCATIONAL VIDEOS AND PARTICIPATING IN **LIVE** CALLS WITH STUDENTS, TEACHERS, AND LEADERS ACROSS POLAND. STUDENTS IN WARSAW, WROCŁAW, RZESZÓW, AND ŁÓDŹ HAD THE UNIQUE OPPORTUNITY TO SPEAK DIRECTLY WITH AN ASTRONAUT IN SPACE AND ASK QUESTIONS ABOUT HUMAN SPACEFLIGHT.

THE EDUCATIONAL PROGRAMME, DESIGNED FOR ALL AGE GROUPS, INCLUDED **LESSONS FROM SPACE, COMPETITIONS, MICROGRAVITY EXPERIMENTS,** AND TWO **AMATEUR RADIO CONTACTS.**

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BACK ON EARTH

THE IGNIS MISSION CONCLUDED AFTER A 20-DAY SPACE JOURNEY WITH THE SPLASHDOWN OF THE DRAGON CAPSULE OFF THE COAST OF CALIFORNIA. DURING NEARLY 320 ORBITS AROUND EARTH, SŁAWOSZ COMPLETED ABOUT 120 HOURS OF TELEWORK ON THE INTERNATIONAL SPACE STATION AND CONTRIBUTED TO MORE THAN 13 EXPERIMENTS FROM HIS ORBITAL OFFICE.

"IT IS A PROFOUND HONOR TO HAVE HAD THE OPPORTUNITY TO REPRESENT THE POLISH PEOPLE IN SPACE. EACH DAY I WORE THE POLISH FLAG IN ORBIT WAS A TREMENDOUS PRIVILEGE, AND I SINCERELY HOPE THAT, IN SOME WAY, I WAS ABLE TO BRING YOU WITH ME ON THAT JOURNEY. IN TRUTH, THIS MARKS ONLY THE BEGINNING. WHAT WE ARE WITNESSING TODAY REFLECTS THE AMBITIONS WE COLLECTIVELY HOLD. I HOPE THAT IN FIVE YEARS, THE POLISH SPACE SECTOR WILL BE A LEADER IN SPACE TECHNOLOGY IN EUROPE." - SAID SŁAWOSZ UZNAŃSKI-WIŚNIEWSKI UPON HIS RETURN TO POLAND.

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