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UAV, UGV AIMING AT THE MOON AND MARS AIMING FOR ATMOSPHERIC OBSERVATIONS ON MARS

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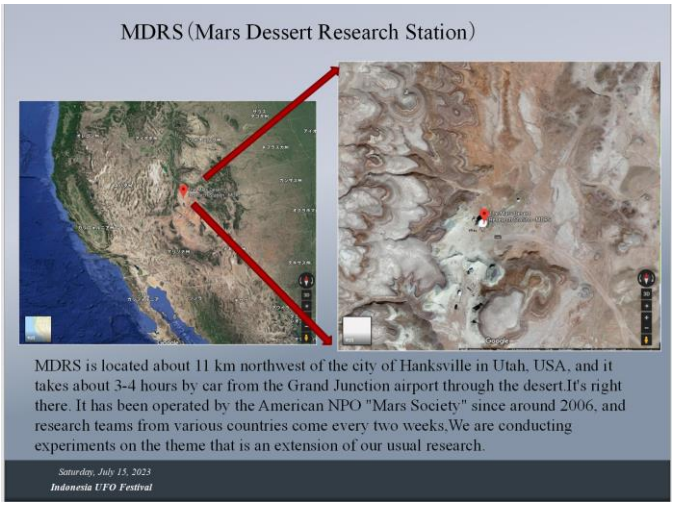
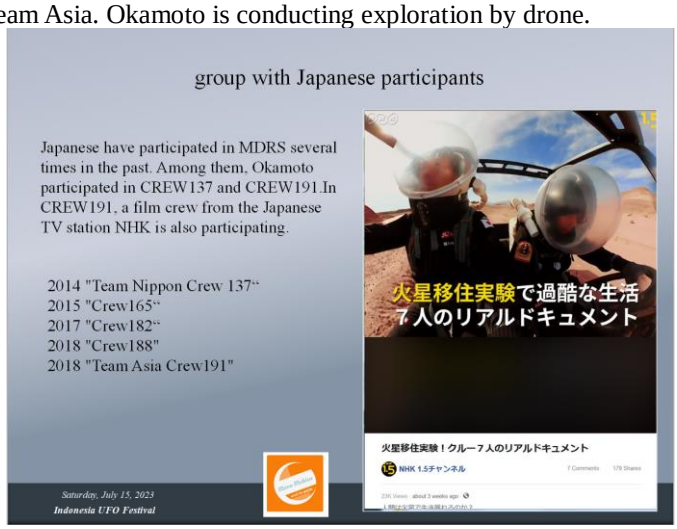
Abstract- In recent years, there has been a growing interest in space development all over the world. Nearby stars such as the Moon and Mars will have manned spaceflights in the near future. Robotic exploration and construction will take place before humans actually go. Many shafts have been found on the Moon and Mars, and the first bases and cities will be built underground. Demonstration experiments will be conducted on Earth for robots that are active on the Moon and Mars.

MDRS (MARS DESERT RESEARCH STATION)

MDRS is a Mars simulation facility built in the desert of Utah, USA. Scientists and engineers from all over the world gather and stay for two weeks. Experiments of each theme, and exploration of the desert by the rover are carried out.

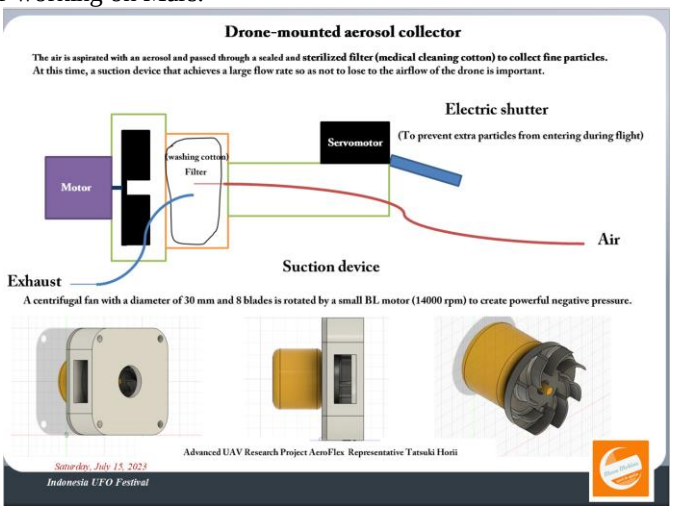


Okamoto and Venzha Christ, Director of the Indonesian Space Association, participated in the 2018 CREW191 Team Asia. Okamoto is conducting exploration by drone.



COLLECTION OF AEROSOLS BY DRONE

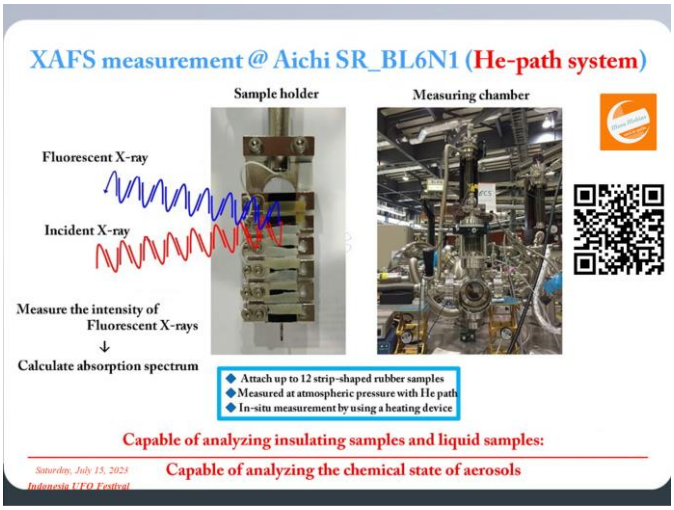
Mars has an atmosphere. 0.7% of Earth's atmospheric pressure. Measuring atmospheric conditions is essential for working on Mars.

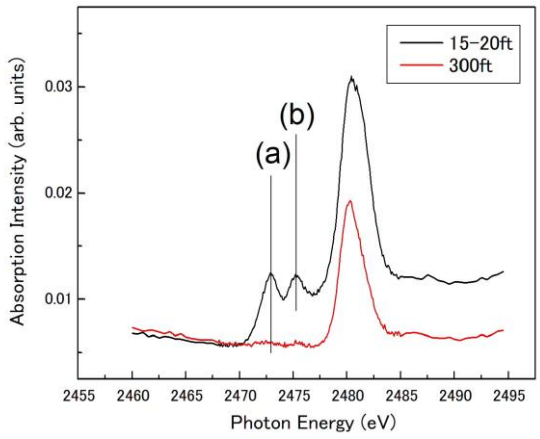


We used drones to collect aerosols. The collected aerosol was subjected to XAFS measurement at a synchrotron radiation facility (in this study, the Aichi Synchrotron Light Facility was used).

This collection device can remotely control the collection time of the aerosol. Aerosol collection was performed at the ``field burning site'' conducted on January 23, 2022, in the vicinity of the Kogai River (downstream of Yamato Bridge, Joso City, Ibaraki Prefecture).

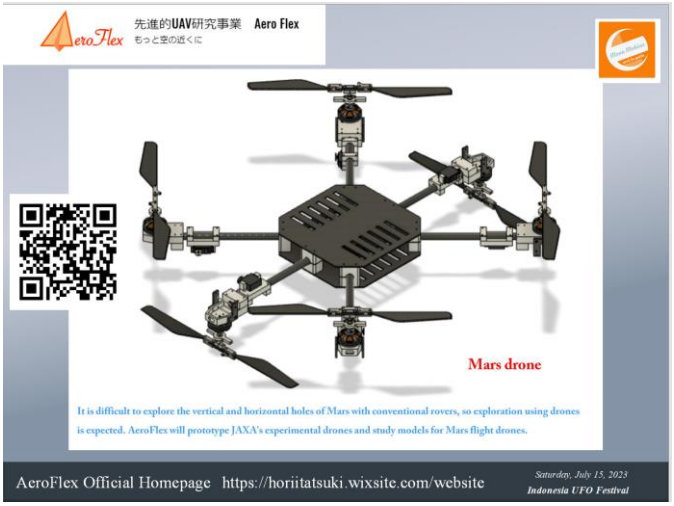
Two collection heights, ``15-20 ft'' and ``300 ft'' above the ground, were selected, and the aerosol collection was performed for 3 minutes at these positions. A cotton puff was used as a collection filter to collect the aerosol.





MARS DRONE

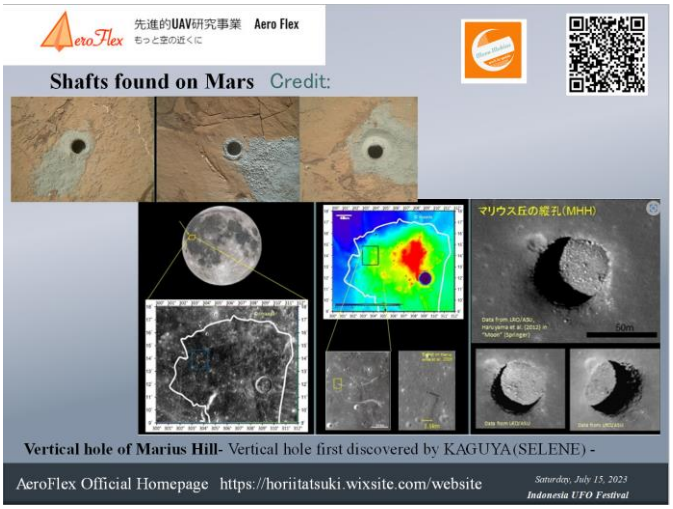
On April 19, 2021, NASA successfully flew a drone on a planet other than Earth for the first time in human history. Ingenuity is the drone that arrived on Mars in the Perseverance rover.



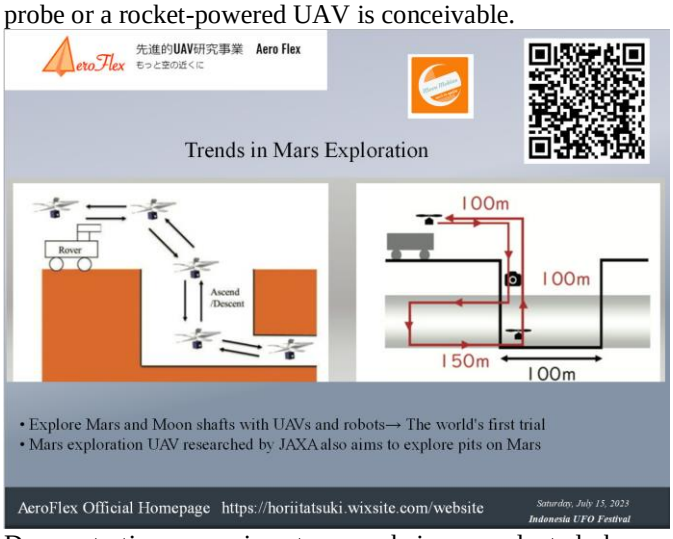
At the University of Tsukuba venture company Aeroflex, we received an order from JAXA in Japan and produced a Mars drone. Equipped with 6 propellers, the middle propeller is placed upside down.

CAVES ON THE MOON AND MARS

In recent years, many vertical holes have been discovered on the Moon and Mars. Drones and rovers will be deployed to explore these holes.



Since the moon has no atmosphere, either a rover-only probe or a rocket-powered UAV is conceivable.

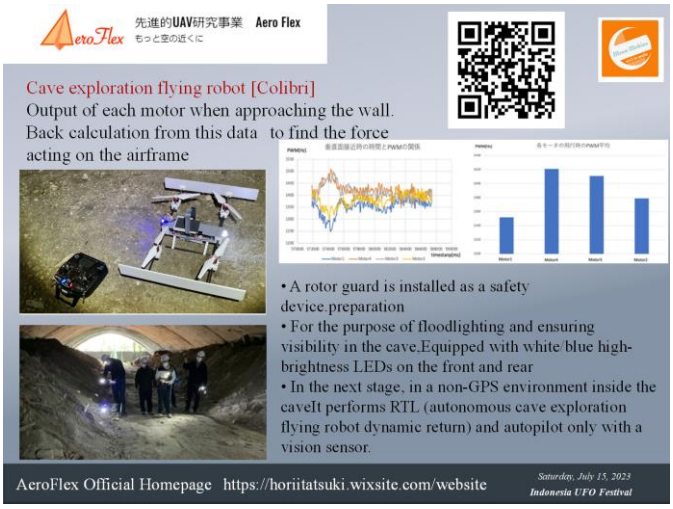


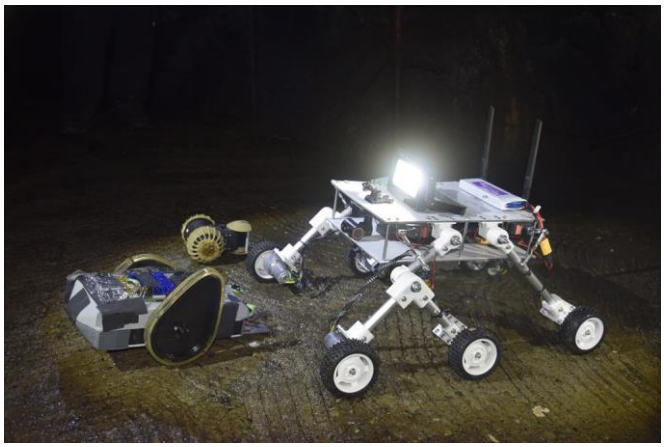
Demonstration experiments are being conducted by actually operating drones and rovers in vertical holes in various parts of Japan.

STATE OF EXPERIMENT IN A CAVE

We are conducting experiments using drones and rovers in various parts of Japan. We are testing both standalone and coordinated exploration.

The Nojima Bunker in Yokohama has been tested many times this year.

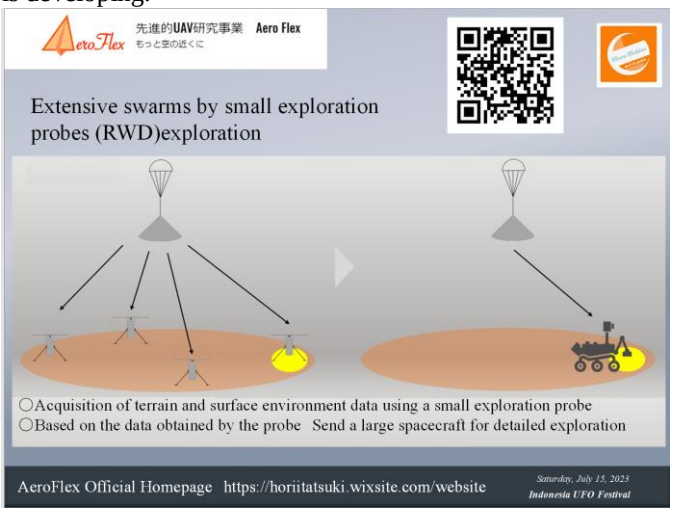




Rover Daimon Yaoki, which is participating in the experiment, will be launched this month. It will be Japan's first rover to go to the moon.

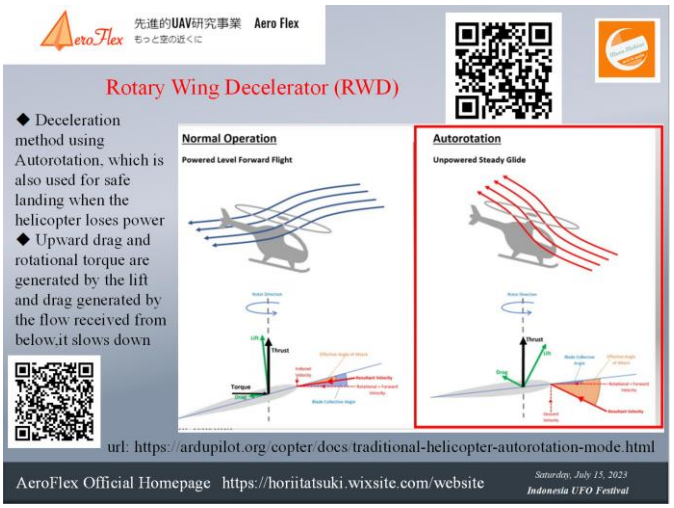
LANDING GEAR ON MARS

Here, we introduce a new landing gear that AeroFlex is developing.

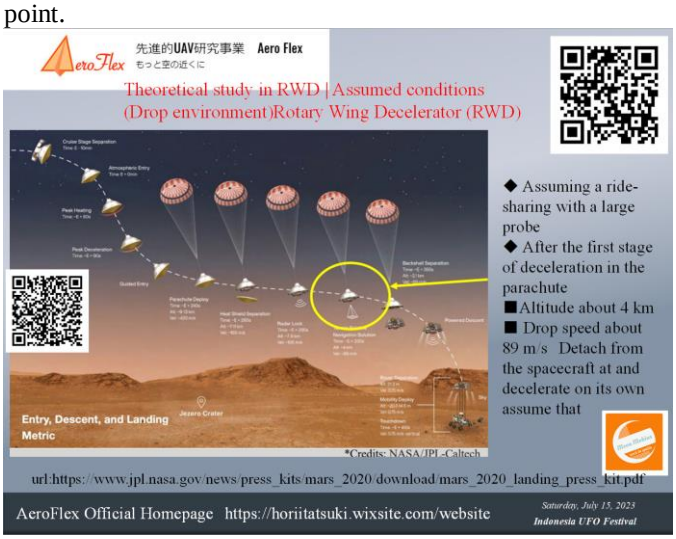


Until now, landers have generally used parachutes.

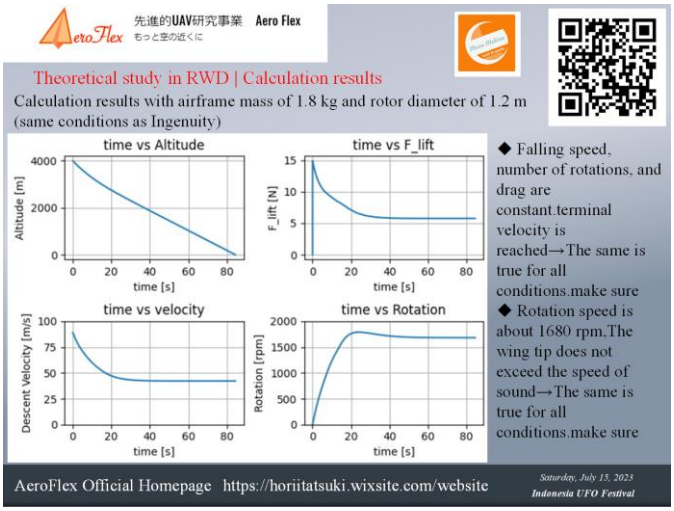
Horii is developing a landing gear that applies the principle of helicopter autorotation.

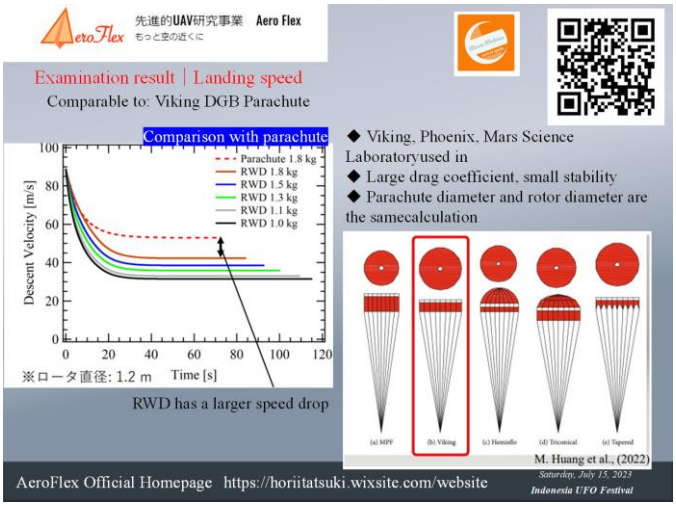


It is easy to control the speed and position of the landing point.



In addition, there are scenes where the deceleration effect is more than the parachute.





On Earth, we are thinking of applying it to a probe that is dropped into a typhoon.

ACKNOWLEDGMENTS

We received a lot of support from JAXA and other universities and research institutes in Japan, as well as from the Indonesian Space Association. Thank you for your continued support. Let's go to space together.

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Air pollution collection and XAFS analysis by drone

Wataru Okamoto, Shinya Yagi 1), Tatsuki Horii 2)

1）Nagoya University 2) AeroFlex

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