Dust dilemma settles on upcoming moon missions

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The world's foremost authority on lunar dust is suggesting the powder-like substance, which is finer than talcum powder and more abrasive than sandpaper, remains a major risk-management problem hampering upcoming space expeditions.

Lunar dust is considered the number one environmental problem on the moon and can cause unpredictable hazards for both robots and humans operating on the dust-covered surface.

Adjunct Professor at The University of Western Australia, Brian O'Brien believes the immobilisation of China's little Yutu lunar rover in January 2014 was likely caused by lunar dust and was the wakeup call

needed to change half-a-century of complacency towards the problem.

Understanding dust is a key consideration for 2018 space expeditions, including China's upcoming Chang'e 4 mission to the far side of the moon, India's Chanrayahaan-2 lunar rover and several other international commercial groups formerly competitors for the now-closed $30million Google Lunar XMedal Prize.

"Many case-study examples have shown for over 50 years, from Surveyor to Apollo to Chang'e-3 Yutu lunar rover, the importance of inescapable lunar dust on the surface of the Earth's Moon," Professor O'Brien said.

"Past expeditions have been plagued by dust with issues arising from clogged equipment and zippers, wrist locks, faceplates and a leaking spacesuit. The most alarming characteristic was how quickly and irreversibly problems could strike," he said.

The Apollo spacesuits and equipment designs left very little room for error and all astronauts experienced issues with dust even with short stays on the surface.

"Amidst all the high technologies of the Apollo mission, the only measurements of movements of lunar dust that have been made were those by my matchbox-sized simplistic Dust Detector Experiments (DDEs) which cost at most $100 to build," Professor O'Brien said.

"NASA did not plan any dust experiments but I thought one was only common sense when very high-speed big and small cosmic rocks had been pulverising rocks on the lunar surface for 4 thousand million years," he said.

These DDEs were put on the Moon by Buzz Aldrin on Apollo 11, Alan

Bean on Apollo 12, Alan Carpenter on Apollo 14 and Jim Irwin on Apollo 15 and transmitted data until they were switched off in 1977.

"These discoveries can help all future international expeditions to the Moon, by humans and robots, by increasing their chances of success, safety, and their cost effectiveness," Professor O'Brien said.

"They are valuable in planning for future missions of setting up a Moon Village and future expeditions to put humans on Mars."

"The time will come, I hope in my lifetime, and maybe with my help inventing higher-technology dust detectors discovering more about the extraterrestrial behaviour of dust on the Moon. Until then, the 30 million measurements by the 4 little Apollo Dust Detectors and 14 peer-reviewed discoveries are all that exist."

Professor O'Brien will present his latest understandings to international groups at the NASA "New Views on Moon-2 Asia" conference in Japan in April and the European Lunar Conference in France this May.

Provided by University of Western Australia