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THE STATUS OF PREPARATION FOR THE ATOMIZATION EXPERIMENT IN MICROGRAVITY ON KIBO

Abstract

Keywords: Atomization, Kibo, microgravity experiment

JAXA has developed Atomization Observation Equipment (AOE) for a space experiment in Kibo/International Space Station (ISS). The purpose of this experiment is to validate a new atomization concept that proposes the existence of a self-destabilizing mechanism in the jet itself [1, 2]. In this experiment, water is injected into air from a finite-length nozzle of a syringe. The injected water jet would then disintegrate at a certain length from the nozzle outlet. We observe the breakup behavior of the water jet with a high-speed camera.

The AOE has three main functions. The first is to inject water from the nozzle at the properly controlled jet issue speed. The second is to acquire images of the water jet with a high-speed camera. The third function is to measure various data such as water speed and temperature.

On Kibo, the AOE will be attached to the Work Volume (WV) section of the Multi-purpose Small Payload Rack (MSPR) during the experiment. After the syringe and drop capture part are set at the AOE, the experiment is conducted via remote commands from the ground. The water jet created in the AOE spontaneously disintegrates into droplets by a self-destabilizing mechanism. These processes are

recorded by a high-speed camera and stowed on a laptop computer, and then the data is downlinked to the ground.

We also developed the software to analyze data recorded by the high-speed camera. We will finally compile the experimental results obtained in Kibo to prove the validity of the new atomization concept.

We will show you the quick results obtained from the onboard experiment.

References

[1] A. Umemura, Self-destabilizing mechanism of a laminar inviscid liquid jet issuing from a circular nozzle, Phys. Rev. E, 83 (2011), 046307.

[2] A. Umemura, S. Kawanabe, S. Suzuki and J. Osaka, Two-valued breakup length of a water jet issuing from a finite-length nozzle under normal gravity, Phys. Rev. E, 84 (2011), 036309.