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EXPERIMENTAL STUDY OF EXTRUSION BASED ADDITIVE MANUFACTURING IN MICROGRAVITY

Abstract

Space Intelligent Manufacturing Technology Innovation Center (SIMTIC) participated in two weeks of microgravity testing with the 28th DLR parabolic flight campaign during the spring of 2016 in Bordeaux-Mérignac. The team tested the effects of microgravity on custom built extrusion based additive manufacturing machine, commonly known as 3D printers. The testing took place on board a modified Airbus A310 aircraft flown by Novespace, under the sponsorship of DLR. SIMTIC has utilized the knowledge gained through this campaign to update the 3D printer such that it will adapt to microgravity in space. Additive manufacturing in space is a potential technology that will not only promote maintainability of space stations on-orbit but also ensure efficient use of resources, which will provide support for manned exploration of space in the future. To realize long-term working of 3D printing in space stations, the characteristics of molding process in microgravity should be studied deeply. Various additive manufacturing technologies have been applied on the ground, but not all of them can be used in microgravity. With three days of parabolic flights, SIMTIC has successfully demonstrated the function of extrusion based additive manufacturing machines in different gravity with different materials and verified that the other technology application is feasible in microgravity.