

Development of a High Speed Rain Impact Capability

Enhancement of a 2-stage light gas gun capability is under development at NASA Marshall Space Flight Center for the purpose of making rain impacts on nosecone and window materials. This paper will discuss current capabilities of this gun system and the path it took to get there. The end goal is to be able to provide realistic rain and thermal environments, simulating rain impact conditions of high speed flight (combined effects). In the past year, the ability to create impacts to simulate rain using 2, 3, and 4 mm Nylon beads in the 7,000-10,000 ft/s (2.13-3.05 km/s) range at room temperature has been demonstrated. It is desired to extend this range down to 6000 ft/s (1.83 km/s) for rain impact purposes. The size range capability will also be extended to launch particles 1 mm and smaller. In addition, a heating capability is being added to the system to potentially cover a temperature range from room temperature to 5000 F. Hydrogen light gas will extend the velocity range to 23,000-26,000 ft/s (7-8 km/s), simulating orbital debris impacts for vehicles that spend a significant amount of time in space. Particle impact precision will also be evaluated during this development process.