Paper ID: 50685
student

IAF MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM (A2)
Facilities and Operations of Microgravity Experiments (5)

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GLIDE, WITHOUT G – A SYSTEMATIC QUANTIFICATION OF GLIDERS 0-G FLIGHT CAPABILITIES

Abstract

Experiments conducted in microgravity concern many sectors of scientific research, namely: life sciences, plasma and materials physics, fluid mechanics, or vegetal biology. Besides, more and more innovative SMEs and NewSpace companies are developing new technologies for different space business applications, while space agencies worldwide show a growing interest for future missions to the Moon or Mars. Zero- or reduced-gravity environments are thus expected to play a key role in the future of space exploration.

However, access to microgravity research is notoriously expensive and complicated. Only few laboratories and research organizations can afford parabolic or suborbital flights, not to mention the cost of sending an experiment to the ISS. Some ground-based solutions (i.e. drop towers, clinostats, and Random Positioning Machines) do exist but they are often either limited to niche research or overbooked. Availability, affordability and long lead times are thus the main issues with existing microgravity platforms.

Our proposed solution, called LIDE (Glide, without a G), is to use gliders instead of classical jet aircraft, as a platform for parabolic flights, thus providing affordable and simple access to a relatively high-quality microgravity environment, anywhere in the world.

Technically, any conventional glider can sustain the load factors inherent to parabolic flights, with flight envelopes usually extending from -3g to +5g at least. Furthermore, several independent investigations (including flight tests performed by LIDE) showed that it is possible to achieve up to 20 parabolas per flight, each of them lasting for 6s and with an acceleration below 0.1g, on a regular day. Our experienced pilots believe that these figures can be further improved with training, optimized flight plan, and more favorable weather conditions.

Further data will be recorded during a campaign of flights in July and August 2019 to systematically quantify the possibilities offered by gliders in terms of achievable weightlessness, length and number of parabolas (per flight, per day, and per year), and constraints on the on-board payload.

Space enthusiasts, universities, and laboratories looking for preliminary results without discouraging access fees, delays, experimental constraints, or application procedures, will be the main beneficiaries of our solution. Companies having already access to space platforms or parabolic flights could also benefit from quick tests of their procedures and initial concepts in their early phase, reducing both development costs and risks.