

SPACE EDUCATION AND OUTREACH SYMPOSIUM (E1)
Interactive Presentations (IP)

Author: Prof. Antoni Perez-Poch
Universitat Politècnica de Catalunya (UPC BarcelonaTech), Spain

PARABOLIC FLIGHT MICROGRAVITY EDUCATIONAL ACTIVITIES IN BARCELONA: THE
"BARCELONA ZERO-G CHALLENGE".**Abstract**

This paper reports on different innovative research and educational activities related to parabolic flights conducted in Barcelona, based at Sabadell Airport and operated by Aeroclub Barcelona-Sabadell, since 2006. A CAP10B single-engine aerobatic aircraft is used, operating in Visual Flight conditions (VFR). Results from test flights have shown that these aircraft provide an environment of hypogravity for small experiments with a gravity quality of at least 0.01 g₀ for as long as 8.5 seconds. An experimenter may operate her or his own experiment in parabolic flight from within the aircraft cockpit.

A specific flight simulator based on SolidWorks was developed to optimize the manoeuvres. This software was used to later train the pilots and get less residual accelerations during the hypogravity period. Results from recent test flights show that these advancements have significantly improved the gravity quality of the platform. Sensitivity to wind gusts have been analyzed. According to our analysis, acceptable wind conditions are a maximum of 15 knots of horizontal gusts, whereas thermal and vertical gusts should be avoided.

Research campaigns and student campaigns have since 2009 been conducted. A student campaign consists of between 2 and 6 local flights, where the student conducts her or his experiment on board during every flight. A local flight provides up to 12 parabolas for each subject. These educational campaigns are known as the "Barcelona Zero-G Challenge", an international contest aimed at motivating students to conduct research in this field. A total of 12 students have flown their experiments on board the aircraft in 3 different educational campaigns (2010, 2011 and 2014), having published their results in relevant symposiums and scientific journals. These campaigns have attracted media attention and have promoted public awareness on aeronautical and space studies. The projects have been carefully peer-reviewed and selected by members of ELGRA (European Low Gravity Research Association) and ESA Education. A new edition of this contest is underway, with the winners expected to fly their experiment in 2017. Furthermore, students from our own University, UPC, have the opportunity of designing and testing their experiments within the framework of this parabolic flights platform. Further information on the contest "Barcelona Zero-G Challenge" can be found at: window2theuniverse.org

In conclusion, this platform has shown to be excellent for educational and outreach campaigns, and also as a testbed for a proof-of-concept, before accessing other microgravity platforms.