

Ground-Based Preparatory Activities (11)  
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Author: Prof. Vladimir Pletser  
Blue Abyss, United Kingdom

Dr. Mindy Howard  
Blue Abyss, United Kingdom  
Dr. Simon Evetts  
Blue Abyss, United Kingdom  
Mr. John Vickers  
Blue Abyss, United Kingdom

BLUE ABYSS GROUND BASED PREPARATORY AND TRAINING ACTIVITIES TO PREPARE  
FOR MOON AND MARS EXPLORATION

**Abstract**

More than 500 human beings have flown in space. This number will increase dramatically and exponentially in the coming years with increasing frequency of commercial orbital flights, and with commercial suborbital flights, followed by human missions to the Moon and Mars. This new step in space exploration will only be possible if proficient, professional training can be provided, and if related technology can be efficiently developed and evaluated for flight. Several commercial endeavours have already been initiated towards these ends, but none will be as complete as the fully integrated approach proposed by Blue Abyss, a UK company to be based in the South-West of England with expected expansion to Houston, Texas, the Arabic peninsula, and the Far-East. The Blue Abyss project is built around four main axes: (1) A versatile multi-use dive pool with platforms from 3 to 20 m, an Astrolab module located at a depth of 12m, and a 50 m shaft, making it the deepest diving pool in the world; (2) The provision of centrifuge services to train future astronauts and to refine the study of the physiological effects of hypergravity; (3) A parabolic flight capability to offer zero, reduced and hypergravity for space preparation training and human physiology research; and (4) A pedagogical and outreach programme to promote a dynamic and exciting approach to STEM-related education for the general public and youth, tomorrow's scientists and astronauts. Underpinning all of these training areas is the added psychological component, that reinforces the effectiveness of training while empowering the different clients and their individual missions and needs. The capability to train at various gravity levels, including 0g and partial g, will be epitomized by the use of the underwater facility and during aircraft parabolic flights. The Astrolab underwater module will accommodate crews for short and long duration missions within pressurised habitats for orbital, Moon or Mars preparation, using special buoyancy equipment for 'extra-vehicular activity' training. Aircraft parabolic flights with dedicated mock-ups of space vehicles, space station modules and extra-terrestrial planetary base modules will offer further capabilities for orbital and 'off world' familiarisation and training. Meticulous preparation using multiple parabolas will enable space mission procedures and protocols to be carefully and successfully practised to prepare for future Moon and Mars exploration missions, but also to enable commercial spaceflight participants to optimize their time in space. This paper will present the latest planning for these unique capabilities under development with international partners, and outline how such an endeavour is important to prepare for the future exploration of extra-terrestrial celestial bodies of the Solar System.