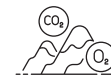


## Large Cube

# Helicopter emergency medical rescue operation at extreme altitude

### The test in a nutshell



Atmosphere



Flights and climbs



Group testing

### terraXcube

terraXcube is Eurac Research's extreme climate simulation centre at the NOI Techpark in Bolzano, South Tyrol, Italy. Within its chambers, even the most extreme of all our Planet's environmental conditions can be created. By combining hypobaric and altitude technology with state-of-the-art environmental simulation, we aim to investigate the effects of extreme climate conditions on humans, ecological processes and industrial products.

The climate chambers differ in size and equipment and can accommodate people, plants and other living organisms for up to extended periods and have the space to accommodate large machines and products.

Each day our team breaks new ground with scientists and industry partners and prepares the path to gain discoveries.

### Test description

The aim of this test is to simulate an emergency medical rescue operation by helicopter at extreme altitude. This scenario includes a rapid ascent (by helicopter) to a maximum altitude of 7,000 m. An outdoor environment of 7,000 m is simulated in the test chamber, while the helicopter cabin is replicated in the airlock and the base-camp in the ambulatory room. The helicopter staff consists of three people: pilot, mountain rescuer and medical doctor. The test simulates a helicopter (airlock) taking off from an airport at an altitude of 1500m and arriving at a base-camp at 5,000 m (ambulatory room) where a stopover is simulated and where the medical doctor is dropped off. Then, the helicopter (airlock), staffed with pilot and mountain rescuer, ascends to 7000m where, in the test chamber, in a simulation of a harsh outdoor environment, a patient (dummy) is treated by the mountain rescuer. After

treatment and immobilisation in a rescue bag, the patient is then evacuated by helicopter and transported to the base-camp for advanced medical care (ambulatory room) before being transported to the airport.

During the experiment, supplemental oxygen is provided as is access to a toilet, kept at the same pressure as the airlock. At all times, both toilet and ambulatory room are kept at 25°C.

A technician and a medical doctor will be present in the control room during the entire experiment. At all times, the technician will have access to all technical data regarding the conditions in the test chamber, ambulatory room and airlock. Similarly, the medical doctor will have continuous access to the medical data of all subjects.

Full medical monitoring of all subjects in the LEC (participants and supervisors) will be continuously ensured and available in the control room during the experiment. In the case of any interruption to the transmission of information relating to the experiment or in the event of a power blackout, the experiment will be terminated by the technician in agreement with the medical supervisor.

### Main focus

Simulation of a helicopter emergency medical rescue operation at extreme altitude.

## Large Cube - General Characteristics and Environment Control

Internal dimensions	12 m x 6 m x 5 m (L x W x H)
Useful Square Footage	137 m <sup>2</sup> + 100 m <sup>2</sup> for test setup
Access to the chamber	Large sliding door: 3.6 m x 4 m (W x H)
Maximum simulated altitude	9,000 m ±10 m (~ 30,000 ft)
Maximum Rate of Climb (ROC)	6 m/s (~ 1,180 ft/min); 14 m/s (~ 2,756 ft/min) in the airlock
Minimum Rate of Climb (ROC)	0.1 m/s (~ 20 ft/min)
Temperature Range According to IEC 60068-3-5	-40...+60°C (± 1°C in time ± 2°C in space)
Temperature Rate of Change According to IEC 60068-3-5	± 0.5°C/min (cooling & heating)
Relative Humidity T > 4°C and according to IEC 60068-3-6	10...95% ± 3%
Humidity Rate of Change T > 4°C and according to IEC 60068-3-6	0.4%/ min cooling; 0.5%/ min heating
Wind	Up to 30 m/s
Precipitations	Rain: 0...60 ±1 mm/h Snow: up to 50 mm/h
Capacity	Up to 12 participants and 3 investigators
Duration of the Study	Up to 45 days without interruption
Medical Monitoring System	Full medical monitoring system for both test subjects and investigators: <ul style="list-style-type: none"> <li>• Portable harness</li> <li>• Wireless data transmission within the chamber</li> <li>• Real time medical data acquisition <ul style="list-style-type: none"> <li>– ECG</li> <li>– SpO2</li> <li>– Blood pressure</li> <li>– Core temperature</li> </ul> </li> <li>• Synchronised medical and environmental parameters</li> <li>• Threshold alarms</li> </ul>
Available Equipment	Climbing wall Treadmills and cycle ergometers Audio & video projection system

## Other Features

Power Supply	230Vac 1~ 50Hz, 400Vac 3~ 50Hz, 63A
Data-acquisition equipment Smoke/Fire detection system + Fire suppression system CC cameras	
Network connection	Gigabit-Ethernet (1000BaseT) PoE, Wi-Fi

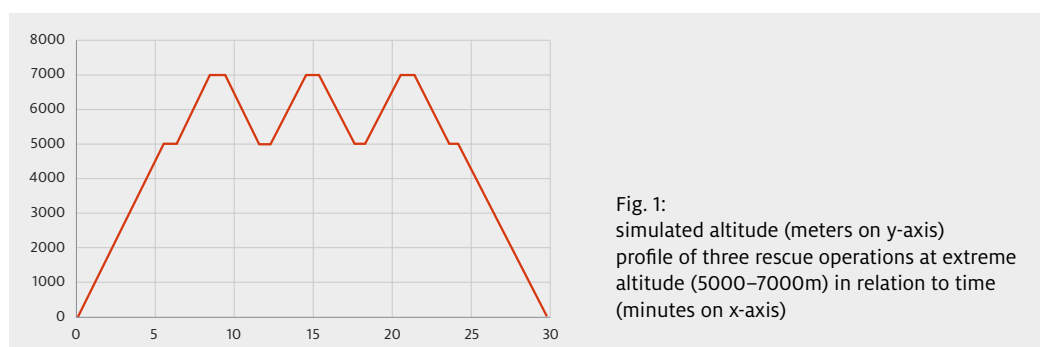


Fig. 1:  
simulated altitude (meters on y-axis)  
profile of three rescue operations at extreme  
altitude (5000–7000m) in relation to time  
(minutes on x-axis)