



## Technology DRDO 067: High Altitude Pulmonary Oedema (HAPO) Chamber

The HAPO Chamber is a life saving equipment for soldiers positioned at high altitudes. HAPO is a condition in which fluid accumulates in lungs causing severe illness. Rapid descent, a treatment of choice, is often impossible due to the topography, adverse weather, or non-availability of transport. In such a scenario, portable hyperbaric bag/chambers present an inexhaustible light weight source of additional oxygen pressure which leads to rapid relief of symptoms of high altitude illness. In the Indian context, the incidence of HAPO was noted to be as high as 15.5% in a group of fresh inductees who were rapidly transported to altitudes between 3,355 and 5,490 m (11,000–18,000 ft)<sup>2, 3</sup>

Years of R&D effort coupled with the evaluation has culminated in the development of an automated bag. The operating pressure inside the developed bag is 2.5psi vis-à-vis 2psi of the above mentioned internationally available bags, thereby enhancing the virtual descent of the patient and hence the recovery. The developed bag is 2.1m long, 0.65m diameter at the head end and 0.5m diameter at the foot end, with a volume of approximately 600 liters to accommodate the HAPO patient, even with the multiple layers of cold-clothing. The bag is provided with a pre-set leak control valve to bleed continuously at a rate of 20 liters per minute in order to avoid the build-up of carbon dioxide inside the bag and a safety pressure relief valve in order to prevent the excessive pressure inside the bag. Several user friendly features have been incorporated in the developed bag. All the materials have been selected to withstand sub-zero temperatures encountered in the usage.

### Description

- Automatic Pressure Controller - Relief Valve Opens at 165 ± 10 mm Hg
- A Lead-Tin Battery for pumping has a maximum voltage after charging of 13 volts. After storage at 30 degrees C for 3 weeks, the charge will drop 0.16V. A fully charged battery can operate the bag for 6 hours
- No physical exertion is required to operate the bag.
- More windows and sound permeability in the bag fabric makes the patient feel reassured, thus improving the subjective comfort.
- Very simple to operate – operates via a single switch.
- No adjustments, no leak valve monitoring or pressure gauge gazing.
- Designed to be stable even on uneven ground because of the carrying handles provided which provide stability and ease of carrying without a stretcher.
- Breathable fabric improves the comfort levels in the bag.

### Development Status

The HAPO bag has been extensively field-tested and the Army has ordered around 3,000 HAPO bags.

### Partner Opportunities

DRDO is seeking licensing opportunities.

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