



TOPOUT

High Efficiency Oxygen Mask CDE Project 15077

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INTRODUCTION:

The Topout oxygen mask has been helping climbers since 2004 to safely achieve 8,000+ metre climbs, using small lightweight oxygen bottles of limited capacity. From a previous death rate of around 1 in 12 Everest summiteers, over a thousand have now summited safely with the Topout system, using oxygen flow rates of only 1 to 2 litres per minute.

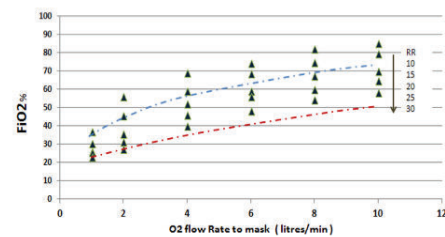
Using the Topout technology we hope to produce a more efficient medical mask for use by the MOD in forward situations, where high flow rate oxygen supplies are currently limited or impossible.

In this project we aimed to verify the performance of the Topout mask compared to existing medical masks (MOD currently use the Hudson non-rebreather), in controlled laboratory conditions – on an instrumented breathing mannikin and on healthy volunteers subject to exercise.

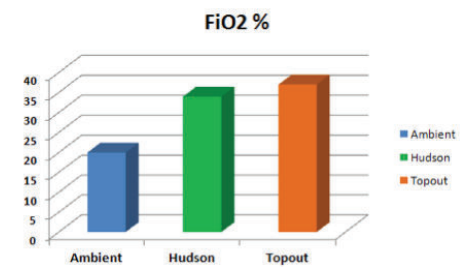
In a separate study we also performed blood oxygen saturation measurements in healthy climbers at 4,500meters subject to hypoxia induced by altitude and exercise.

RESULTS:

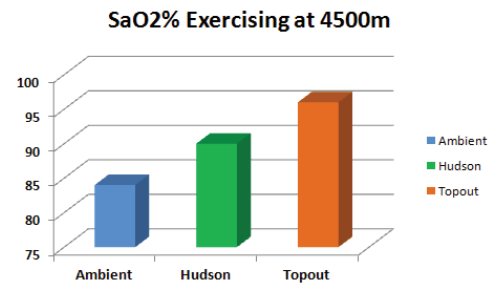
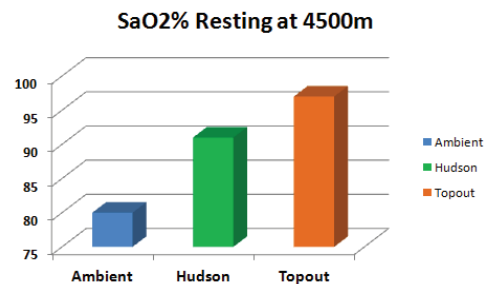
1. Mannikin (Topout v Hudson)



2. Healthy subjects at Sea Level (TV 850, RR13)



3. Healthy hypoxic subjects at altitude



CONCLUSION:

Topout makes more efficient use of low oxygen flow supplies in a range of conditions

NEXT STEPS:

- Develop a further improved mask based on learnings from this project
- Develop an instrumented test lung system that measures the dynamic flow, mixing and delivery of oxygen to the deep lung – compared to the “averaged” approach taken at present
- Develop an improved mathematical model of tidal breathing from masks with reservoir bags and use to understand the optimisation of breathing systems
- Collaborate with developers of portable oxygen supplies to offer a compatible system of lightweight oxygen source and optimised mask
- Validate the new system in a military medical facility and in an NHS environment on real patients

