



A Return to Hypobaric High Altitude Training For the Royal Canadian Air Force

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Background

- Royal Canadian Air Force (RCAF) ceased high altitude training in 2008
- RCAF initiated high altitude operations in 2014
10 Flights a year to FL 249
- Resulted in aeromedical (AMT) training and operations being misaligned

Hypoxia and DCS Incident

FSIMS 171217 – 14 Nov 2016



- During a High Altitude Para (HAP) drop, both pilots experienced feelings of tingling and coolness (FL 249)
- Appropriate procedures were followed: selecting EMERG on oxygen regulator, re-pressurizing the cabin, initiating a descent
- Both pilots received hyperbaric treatment for DCS
- Flight Safety Investigation;
 - Oxygen regulators were functioning properly
 - Mask seal was problematic
 - Misaligned training (PM 7)



Why Change Hypobaric High Altitude Training?



- The Combined Altitude Depleted Oxygen (CADO) system was implemented in 2008. Hypoxia training is conducted at 10,000 ft with a simulated altitude of 25,000 ft
- The Reduced Oxygen Breathing Device (ROBD) was also implemented for ejection seat crew recertification training in 2008.
- CADO and ROBD implementation was to eliminate the risk of altitude induced Decompression Sickness (DCS)

AMT Misaligned with Mission Profile



- Physiological effects of high altitude are not experienced
- Lectures and practical training focus on accidental exposure to high altitude versus purposeful exposure
- AMT training utilizes quick don masks for hypoxia recognition training versus operational ALSE (aviation life support equipment). Therefore training for preflight and inflight checks were misaligned with operational procedures.
- Pre-breathing for high altitude ops is neither instructed nor practiced.



Current HRT Profile (CADO)

Ascent: 5000 fpm

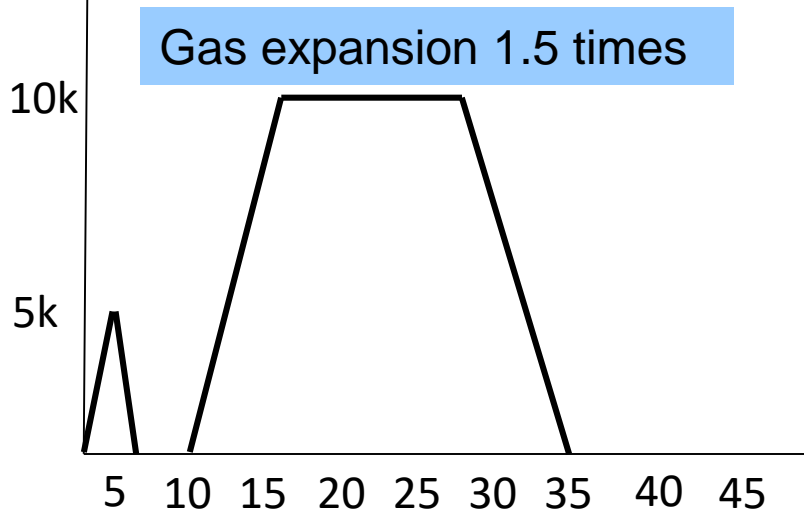
Prebreathe: 0 min

T Above 18k: 0 min

Descent: 3000 fpm

Equipment:

- Pilots: HA/LP Mask
- Aircrew: Quick Don



Current Mission Profile

Ascent: 2000 fpm

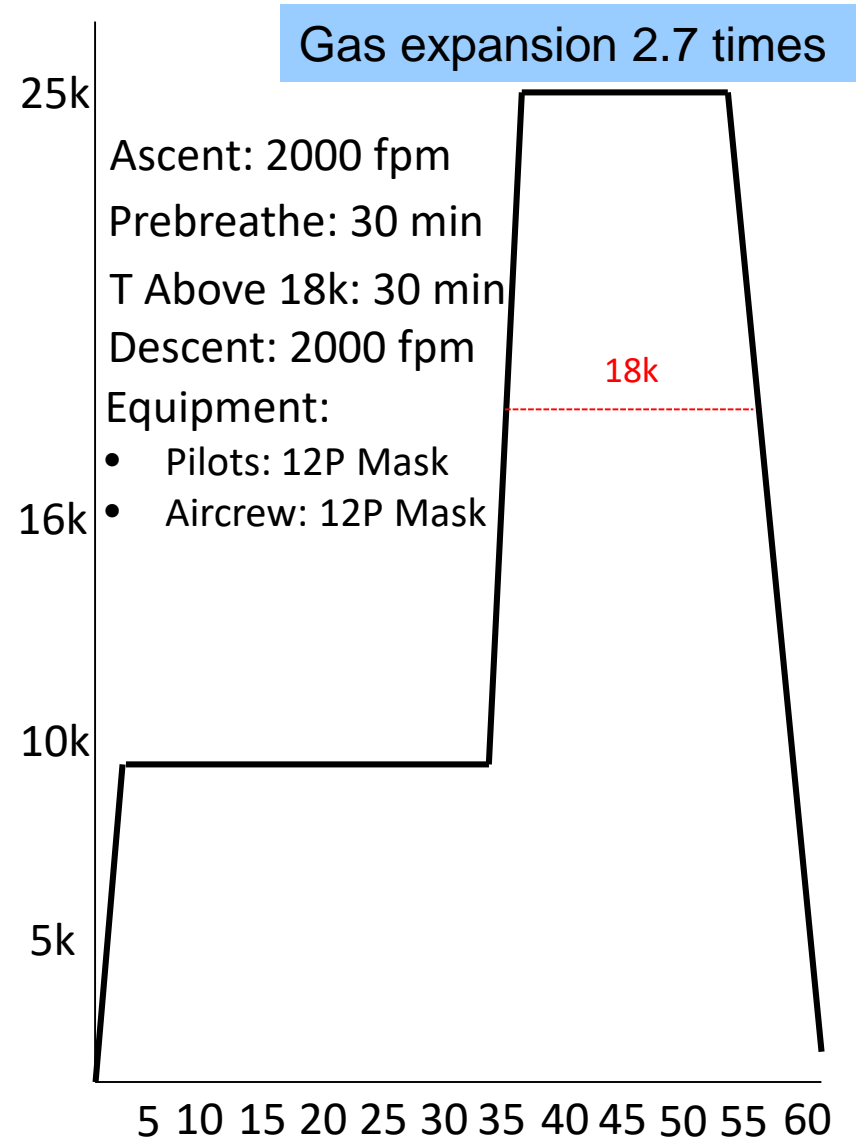
Prebreathe: 30 min

T Above 18k: 30 min

Descent: 2000 fpm

Equipment:

- Pilots: 12P Mask
- Aircrew: 12P Mask





Constraints (must do)

- Continue to train aircrew according to the Aeromedical Program (214), which is based on STANAG 3114.
- Address Preventive Measure 7 of FSIMS 171217
- Align the training to the operational mandate
- Abide by RCAF Surgeon General pre-breathing guidelines

RCAF Pre-Breathing Guidelines



FL	Pre-breathe (min)	Time/exposure (min)	Max accumulated time at altitude/24h (min)
FL 100 to 179	Supplemental oxygen	240	Unlimited
FL 180 to 249	30	60	110
FL 250 to 299	60	45	60
FL 300 to 349	90	30	30





Restraints (must not do)

- Training risk profile will not exceed mission risk profile
- No hypoxia training above 10,000 feet
- DCS risk in training must remain $< 10\%$ (ie $< 10/1000$) as per RCAF Surgeon General operational directive (assumption)



Courses of Action



COA	Description
COA 1	Status Quo AMT for accidental high altitude exposure Only pilots get training on the operational mask
COA 2	Lectures for purposeful exposure to high altitude ALSE fittings/training (no hypobaric exposure) Pilots, LM, TCM training on the operational mask
COA 3	Lectures on purposeful exposure to high altitude ALSE fittings/training Pilots, LM, TCM training on the operational mask Hypobaric chamber profile to 25k feet matching mission profile ascent/descent rates, pre-breathing. Hypobaric ALSE famil at 25k feet Hypoxia demo at 10k with CADO





Evaluation Factors

- DCS risk
- Prepares operators for mission profile
- Prepares operators for physiological risk and effects of purposeful exposure to high altitude.
- Confirms operator confidence in ALSE





COA Evaluation

Evaluation Factor	COA 1 (status quo)	COA 2 (lectures, no chamber)	COA 3 (lectures and chambers)
DCS			< 4.74 / 1000
Prepares operators for mission profile			
Prepares operators for physiological risk and effects of purposeful exposure to high altitude.			
Confirms operator confidence in ALSE			

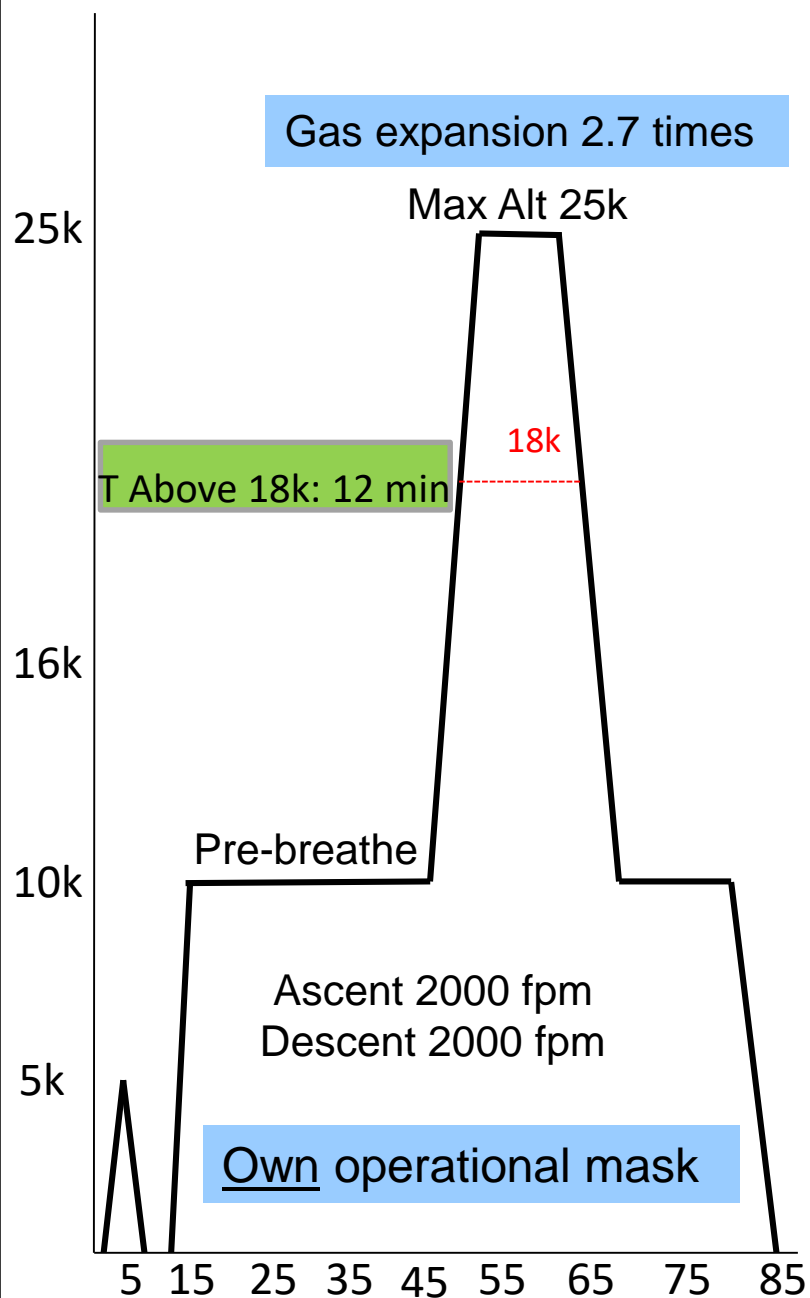
Hypobaric Profiles					
	2003-2008	2008 to Present		2014 to Present (aircraft)	Future (COA 3)
Profile Name	Hypoxia	CADO	ROBD	Mission Profile	Proposed Profile
Hypoxia Demo Altitude (ft)	30k	25k sim at 10k	25k sim at GL	0	25k sim at 10k
Max Altitude (ft)	30k	10k	GL	25k	25k
Time Above 18k	14 min	0 min	0 min	30 min (avg)	12 min
Ascent Rate	5000 fpm	5000 fpm		2000 fpm	2000 fpm
DCS Rate	4.74 / 1000	0	0	6 / 1000	< 4.74 / 1000

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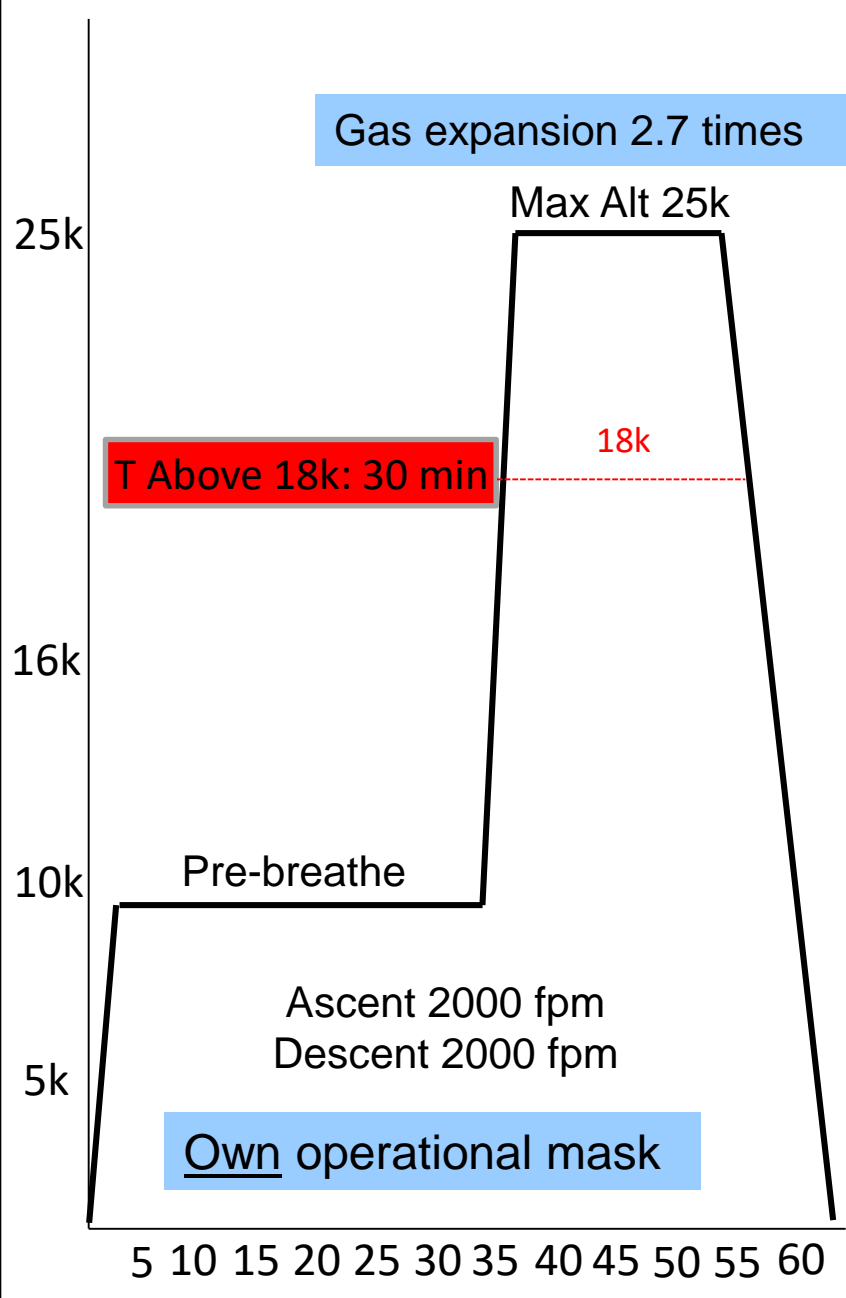
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Proposed High Altitude Profile



Current Mission Profile (436 Sqn)



Summary



- RCAF is currently conducting high altitude operations, and will continue to do so
- RCAF Surgeon approved COA 3 (without a hypoxia demo) for RCAF operators who fly in support of high altitude missions
- First hypobaric high altitude course was completed in December 2018, and scheduled to run annually
- 12 of 13 students had ALSE issues with their equipment
- Ongoing work for the hypobaric high altitude course
 - currency & waivers



Questions?





References:

- FSIMS 171217
- BGen Downes Thesis: Altitude Chamber Decompression Sickness Rate of the New Canadian Forces Hypoxia Profile
- In-flight Emergency Procedures and pre-breathing Guidelines for High Altitude Parachuting (HAP) Presentation by Maj Minkley and WO Dalebozik.
- A-MD-214-000/PT-001 – Aeromedical Training for CF