2182D-11680 (AUMS/SEG)

28 April 2008

OXYGEN SYSTEM COMPATILITY
TEST – CF188 NACES CONFIGURATION

Ref: A. Telecons Ellis/Michas/Gordge 28 Aug 2007
B. Tasking Project Definition, 2182D-11680(DTAES 7-4-2), 12 Oct 07
C. Telecon Michas/Rioux, Jan 08

BACKGROUND

1. The CF188 fleet will be retrofitted with the SJU-17 ejection seat also known as the Navy Aircrew Common Ejection Seat (NACES). A change in oxygen system plumbing is associated with the retrofit. There is a requirement to confirm oxygen system compatibility specifically between the SABRE regulator and plumbing for the CF188 NACES configuration (Ref A), and DRDC Toronto was tasked accordingly (Ref B).

AIM and OBJECTIVES

2. The aim of this task was to confirm compatibility of the oxygen SABRE regulator and plumbing configuration in CF188 aircraft equipped with the NACES SJU-17 ejection seat. The objective was to conduct tests throughout the oxygen system operating range.

3. Although the inner configuration of all parts is not visible, the apparent physical change to the oxygen system for NACES is a slight increase in the most relevant dimension, namely inside diameter. The expected impact would be to improve overall system performance. Direct comparative testing between the configurations was considered unnecessary (Ref C).

EQUIPMENT UNDER TEST

4. The test item comprises CF188 oxygen system components in the NACES configuration from the pull-disconnect interface between the aircraft supply and seat kit to through to the aircrew oxygen mask including seat kit and Sabre oxygen regulator.

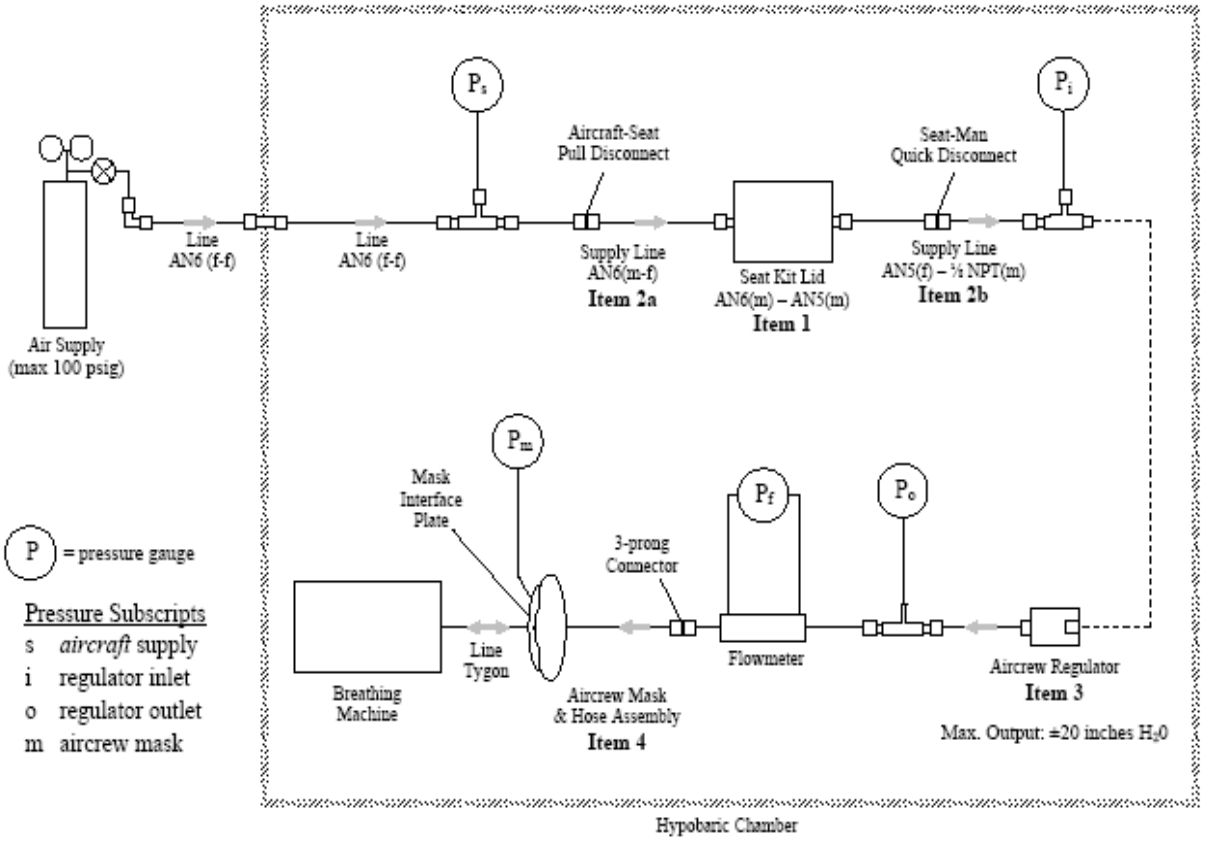
METHOD

5. Testing was conducted in the hypobaric chamber at DRDC Toronto. Test set-up was as illustrated in Figure 1. A total of 84 tests were conducted with variable settings as summarized in Table 1 comprising a common baseline test[1] and five test groups for examining effects of varied parameters:

a. inlet pressure (P_{in}) – 18 tests;
b. mode (M) – 7 tests;
c. altitude (H) – 28 tests;
d. multiple extremes – 16 tests; and
e. breathing profile – 14 tests.

[1] The single baseline test is applicable in comparisons within each *parameter effect* group.

Figure 1. NACES oxygen system compatibility test setup



Gas medium used in the test system was air with inlet (simulated aircraft supply) pressure set at approximately 40, 70 (*normal*) and 100 psig. The oxygen regulator was tested in both operating modes: *dilution* (D) and *100% oxygen* (100%). Test altitude (H) ranged from ground level (where mass flow and likelihood of unusual characteristic is highest) to 45,000 feet, with three selected intermediate settings. Various dynamic sinusoidal flow-time profiles, from very low to very high rates, were generated using a programmable breathing machine interfaced with the oxygen mask. Ranges of breathing rate, minute volume (or average flow, f_{avg}) and peak inspiration flow (f_{pk}) were, respectively, 8-22 breaths per minute (bpm), 5-40 lpm minute and 30-250 lpm. Expiration was a sinusoidal profile over a fixed time interval, with range of peak flow 40-310 lpm (determined by tidal volume).

6. Test interval was 90 s with the following continuous (50 Hz) data measures:
   a. inspiration flow at mask hose (Fleish pneumotach); and
   b. pressure (Validyne transducer):
      1) *aircraft* supply before pull-disconnect;
      2) regulator inlet;
      3) regulator outlet, or mask hose; and
      4) mask cavity.

7. Data were examined for trends and any sign of undesirable characteristics such as unstable, excessive or insufficient pressure, the latter reflecting gas supply “starvation”.

RESULTS and DISCUSSION

8. Results are presented graphically in Annex A on a separate sheet for each test, sheets in turn comprising separate panels of breathing machine (flow generator) position, demand ("inspiration") flow and the four measured pressures.

9. The data shows that pressures are consistently and highly responsive to flow demand regardless of breathing rate (number of breaths per minute) and minute volume (average demand per minute). Flow demand is successfully achieved in all conditions. Pressure responds to the breathing cycle and becomes stable immediately in that successive cycles are essentially identical. Higher frequency oscillations typical in 100% mode (e.g., Test 20) are attributed to regulator and mask characteristics and considered of negligible consequence. Mask pressure appears to be determined more by mask resistance characteristics than the oxygen supply system, with magnitudes during the breathing cycle (minimum, maximum and swing) consistently greater than those at the regulator outlet. There is no evidence of insufficient supply pressure (regulator "starvation") even at low setting, *100%* mode and extreme flow demand (e.g., Tests 17, 66). Multiple parameter changes seem consistent with combined effects of individual parameter changes. Overall, no anomalies or areas of concern are evident regarding the NACES breathing system configuration.

10. A few expected trends and known oxygen system properties were seen as follows:

a. Safety pressure in *dilution* mode at 30K (e.g., Test 41), in *100%* mode at low altitude (e.g., Test 20). The same level of positive pressure at high altitude in both operating modes (e.g., Test 60 vs 68).

b. Slight decrease in mask pressure (minimum, maximum & swing) as altitude increases through 15K (e.g., Test 1 vs 27 vs 34), attributed to less mass flow at altitude for a given volume demand.

CONCLUSION

11. Results of the extensive tests her e of the NACES oxygen system configuration, in each regulator mode and over the expected operating range for inlet pressure, altitude and breathing profile, individually and in combination, demonstrate acceptable performance and confirm compatibility among system components.

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Reviewed:  30 Apr 08

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Table 1. CF188 NACES Oxygen System Compatibility Tests

M	regulator operating mode	R	breathing rate
D	dilution	F_{avg}	average flow, or minute ventilation
P_{in}	air supply pressure	$F_{pk\text{-}in}$	peak flow in breathing cycle
H	altitude	GL	ground level

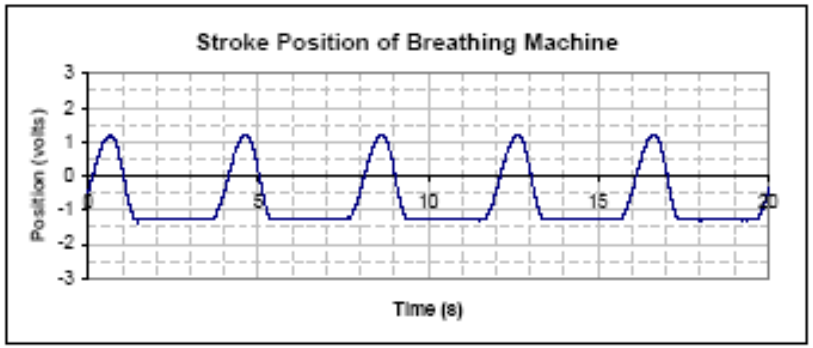
Empty cells: baseline (bold) values apply Vertical bar: value above applies

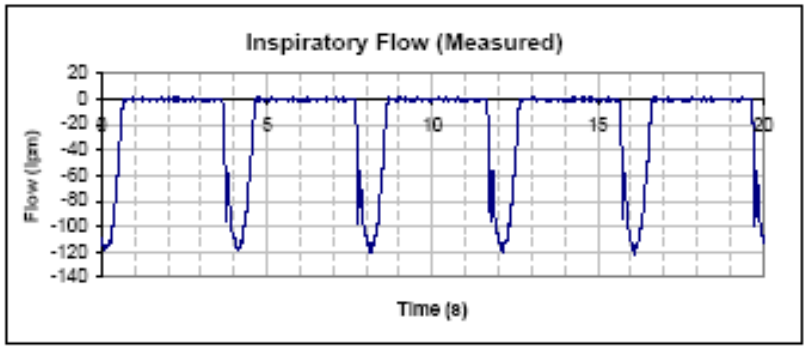
Series	Test #	M	P_{in} (psig)	H (Kft)	R (bpm)	F_{avg} (lpm)	$F_{pk\text{-}in}$ (lpm)
1 Baseline	1	**D**	**70**	**GL**	**15**	**20**	**120**
2 Supply Pressure	1	**D**	**70**	**GL**	**15**	**20**	**120**
	2				8		
	3				22		
	4		40				
	5		|				
	6		|		8		
	7		|		22		
	8		|			5	30
	9		|			37.5	225
	10		|				80
	11		|				200
	12		100				
	13		|				
	14		|		8		
	15		|		22		
	16		|			5	30
	17		|			37.5	225
	18		|				80
	19		|				200
3 Mode	1	**D**	**70**	**GL**	**15**	**20**	**120**
	2				8		
	3				22		
	20	100%					
	21	|			8		
	22	|			22		
	23	|				5	30
	24	|				37.5	225
	25	|					80
	26	|					200
4 Altitude	1	**D**	**70**	**GL**	**15**	**20**	**120**
	2				8		
	3				22		
	27			7.5			
	28			|	8		
	29			|	22		
	30			|		5	30
	31			|		37.5	225
	32			|			80
	33			|			200
	34			15			
	35			|	8		
	36			|	22		
	37			|		5	30
	38			|		37.5	225
	39			|			80
	40			|			200

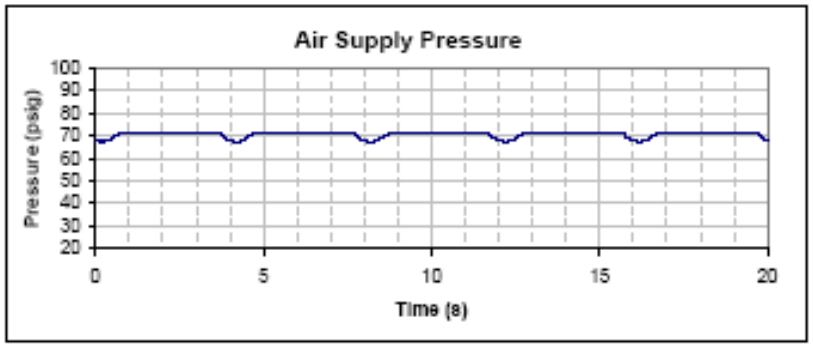
Series	Test #	M	P_{in} (psig)	H (Kft)	R (bpm)	F_{avg} (lpm)	$F_{pk\text{-}in}$ (lpm)
4 (con't) Altitude	41			30			
	42			|	8		
	43			|	22		
	44			|		5	30
	45			|		37.5	225
	46			|			80
	47			|			200
	48			45			
	49			|	8		
	50			|	22		
	51			|		5	30
	52			|		37.5	225
	53			|			80
	54			|			200
5 Multiple Extremes	1	**D**	**70**	**GL**	**15**	**20**	**120**
	2				8		
	3				22		
	55		40	7.5	8	5	50
	56		|	|	|	20	200
	57		|	|	22	5	50
	58		|	|	|	40	250
	59		|	45	8	5	20
	60		|	|	|	20	80
	61		|	|	22	5	20
	62		|	|	|	40	160
	63	100%	|	7.5	8	5	50
	64	|	|	|	|	20	200
	65	|	|	|	22	5	50
	66	|	|	|	|	40	250
	67	|	|	45	8	5	20
	68	|	|	|	|	20	80
	69	|	|	|	22	5	20
	70	|	|	|	|	40	160
6 Breathing Profile	71				8	5	30
	72				|	10	60
	2				|	20	120
	73					5	30
	74					10	60
	1	**D**	**70**	**GL**	**15**	**20**	**120**
	75					30	180
	76					37.5	225
	77					5	20
	78					20	80
	79					37.5	150
	80					5	50
	81					20	200
	82				22	10	60
	3				|	20	120
	83				|	30	180
	84				|	40	250

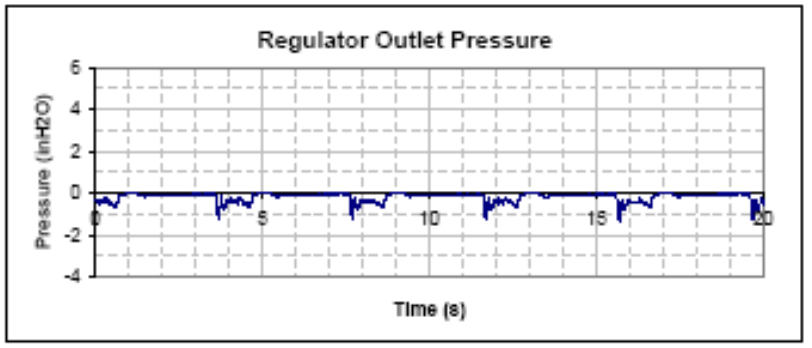
CF188 Oxygen System Compatability Test - NACES Configuration

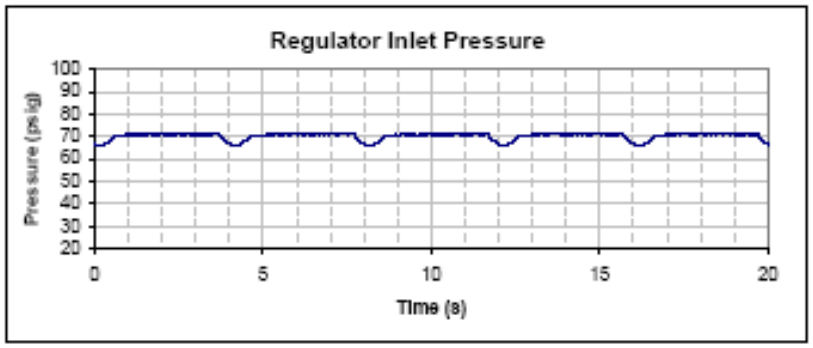
Group:	1 - Baseline	Settings				Altitude	GL
Test #:	1	Breathing Rate (bpm)	15	Minute Volume (l)	20	Inlet Pressure (psig)	70
		Stroke Volume (l)	1.33	Peak Inspired Flow (lpm)	120	Regulator Mode	Dilution

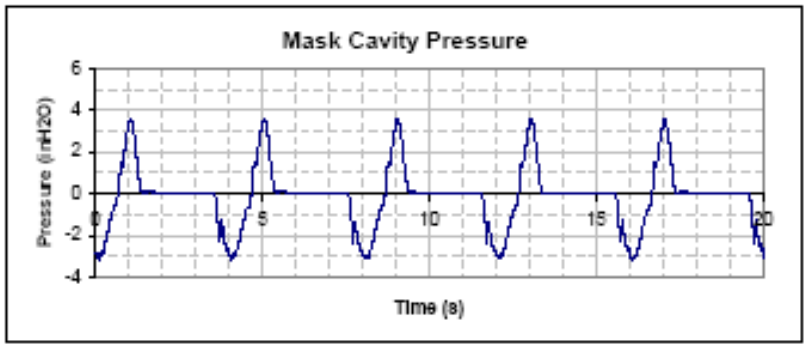






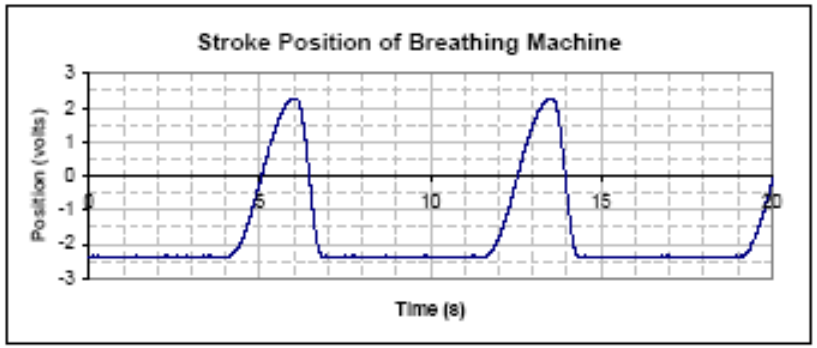


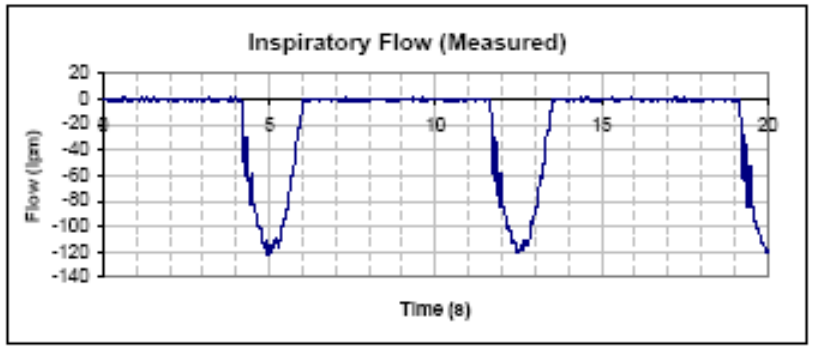


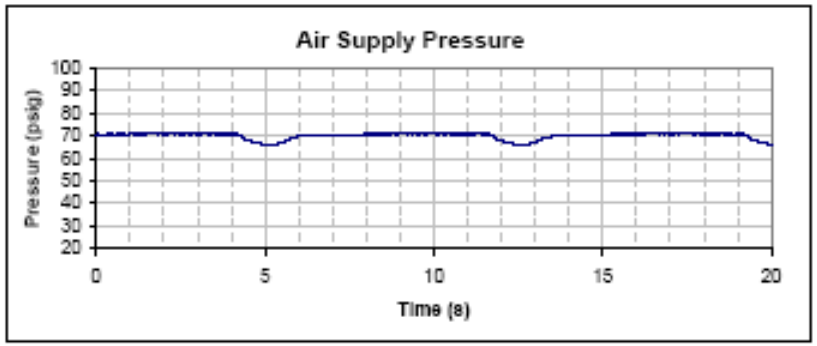


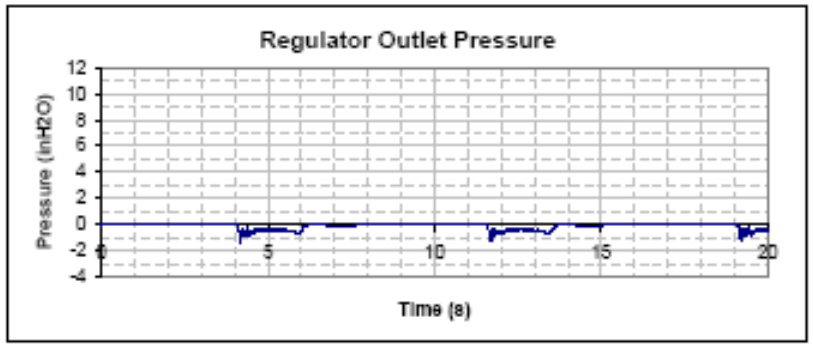
CF188 Oxygen System Compatability Test - NACES Configuration

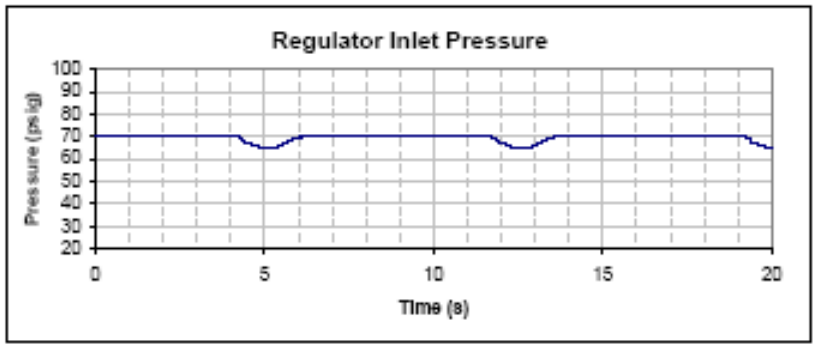
Group:	2 - Varied Inlet Pressure	Settings				Altitude	GL
Test #:	2	Breathing Rate (bpm)	8	Minute Volume (l)	20	Inlet Pressure (psig)	70
		Stroke Volume (l)	2.5	Peak Inspired Flow (lpm)	120	Regulator Mode	Dilution

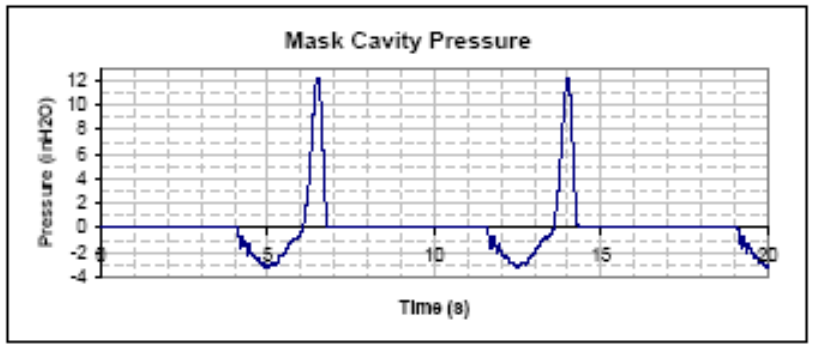






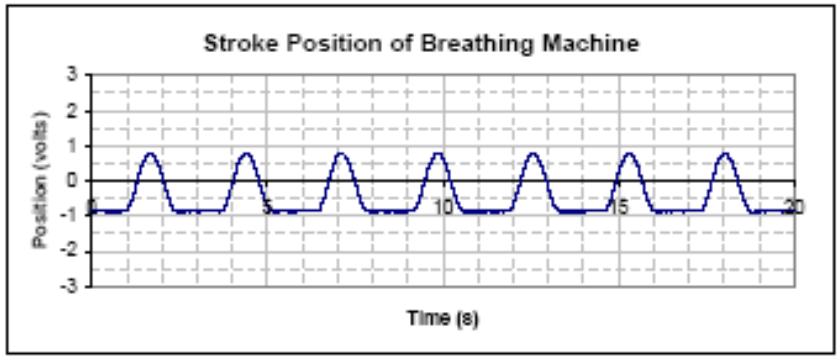


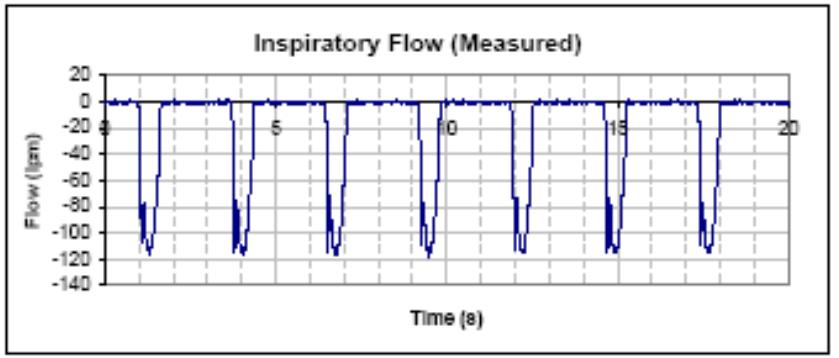


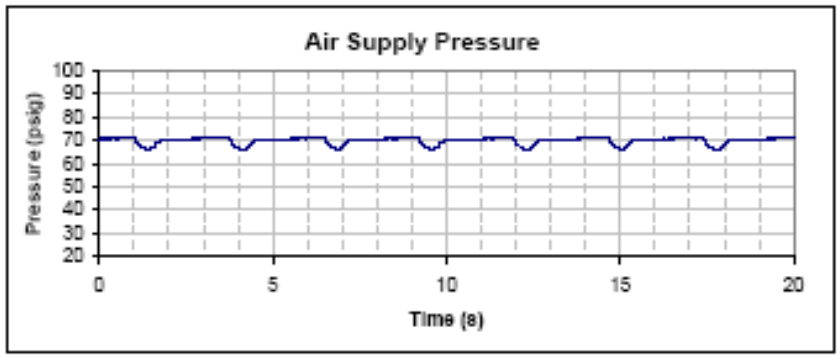


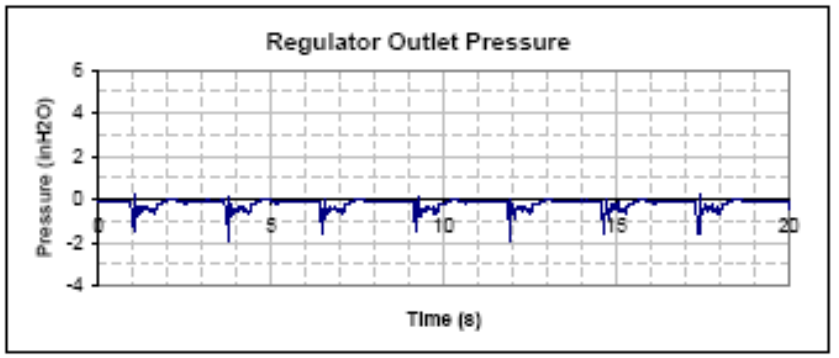
CF188 Oxygen System Compatability Test - NACES Configuration

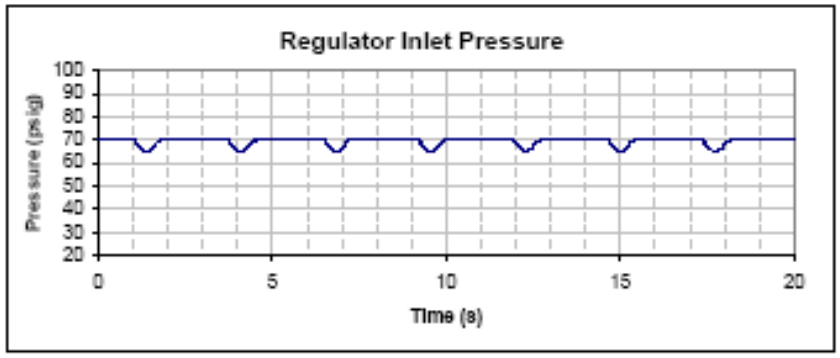
Group:	2 - Varied Inlet Pressure	Settings				Altitude	GL
Test #:	3	Breathing Rate (bpm)	22	Minute Volume (l)	20	Inlet Pressure (psig)	70
		Stroke Volume (l)	0.91	Peak Inspired Flow (lpm)	120	Regulator Mode	Dilution

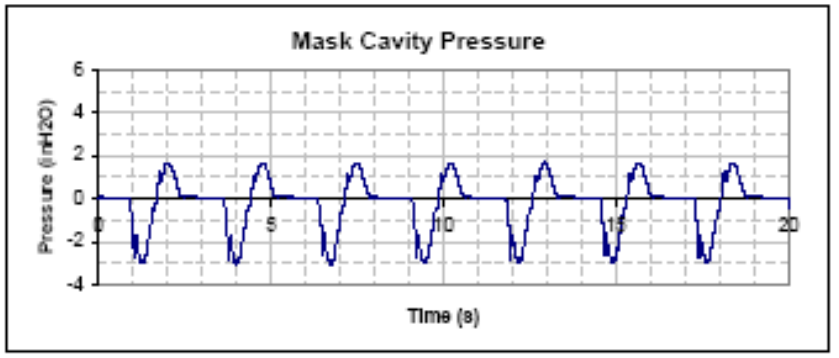






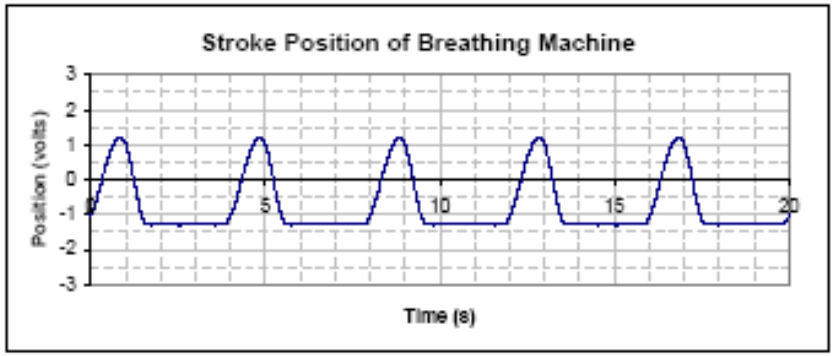


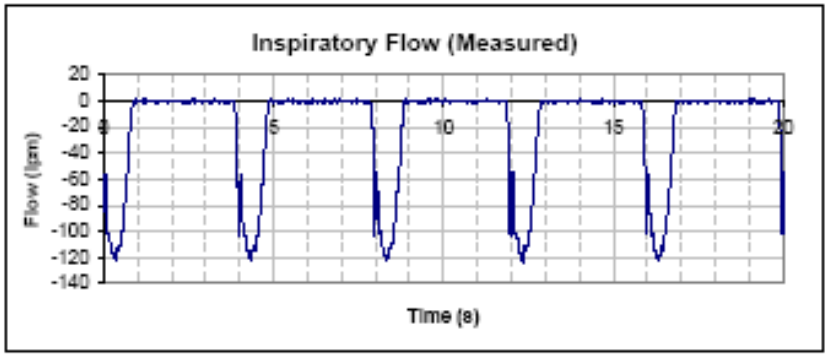


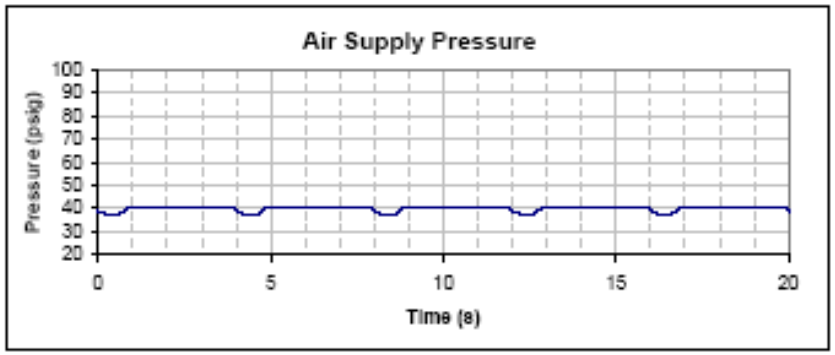


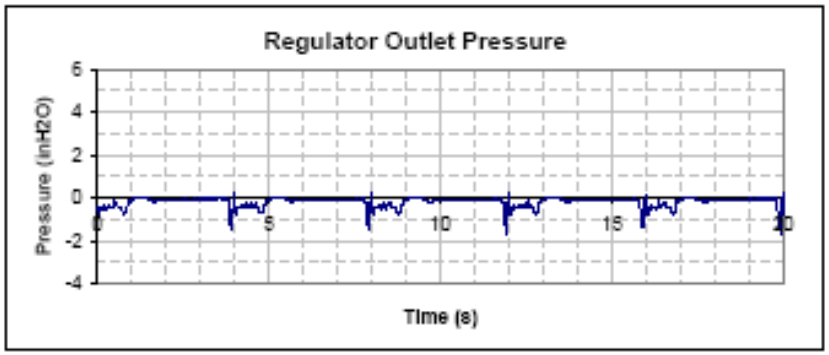
CF188 Oxygen System Compatability Test - NACES Configuration

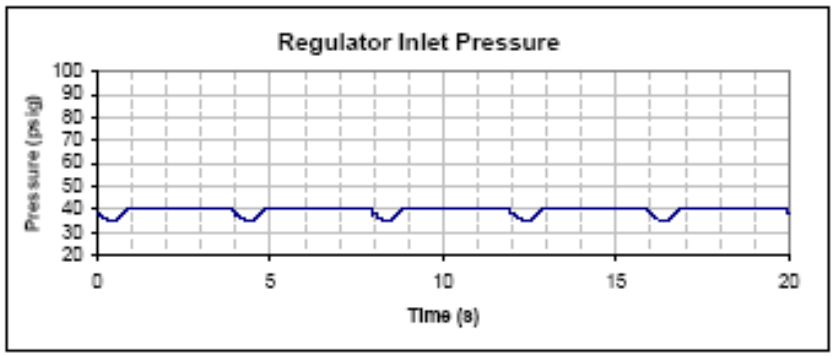
Group:	2 - Varied Inlet Pressure	Settings				Altitude	GL
Test #:	4	Breathing Rate (bpm)	15	Minute Volume (l)	20	Inlet Pressure (psig)	40
		Stroke Volume (l)	1.33	Peak Inspired Flow (lpm)	120	Regulator Mode	Dilution

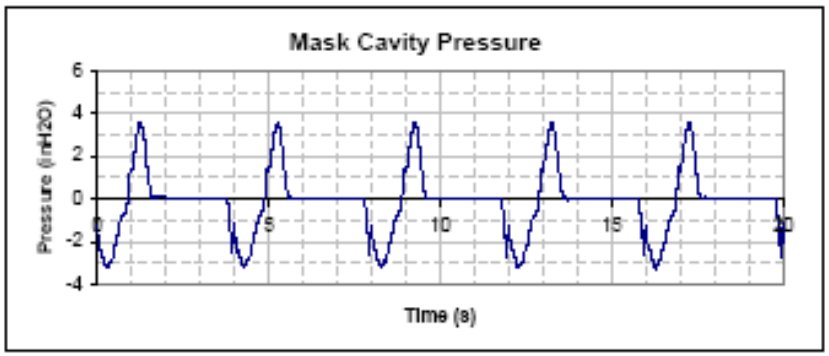






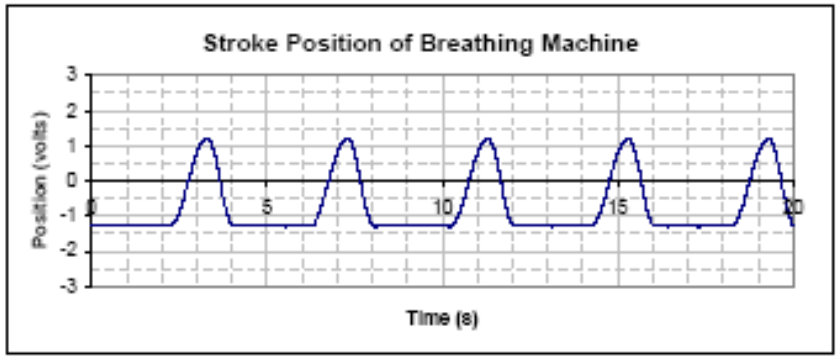


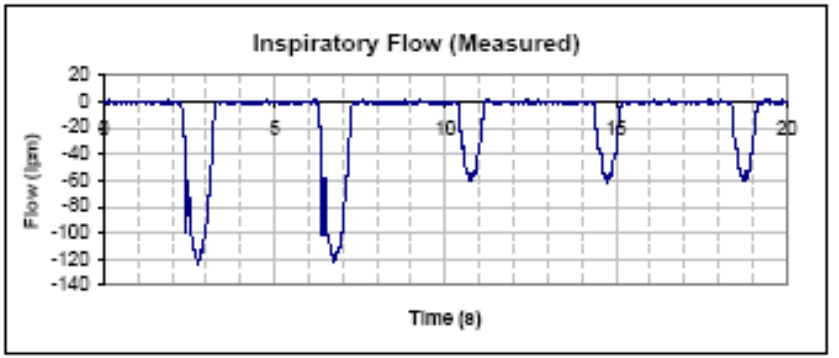


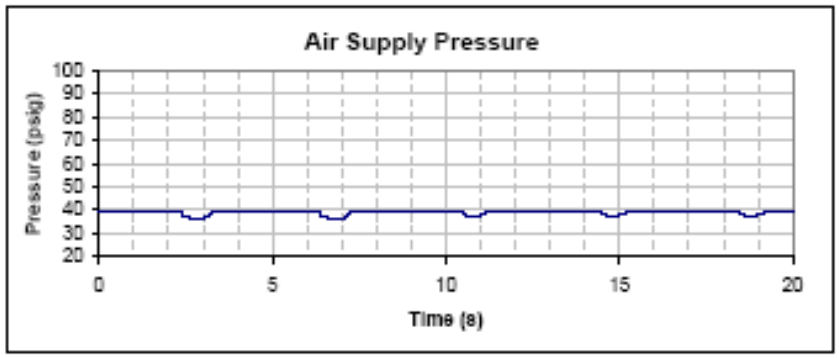


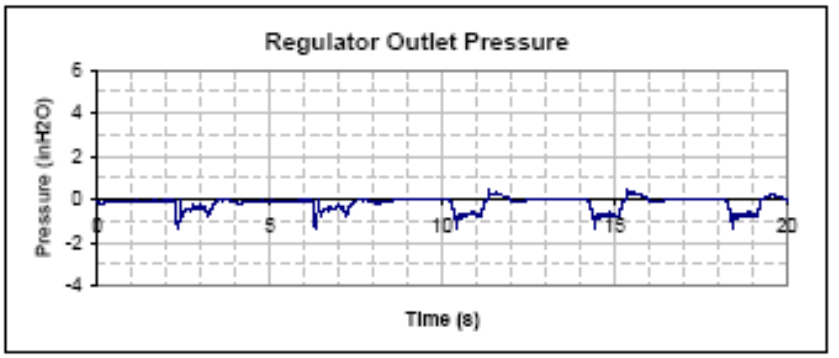
CF188 Oxygen System Compatability Test - NACES Configuration

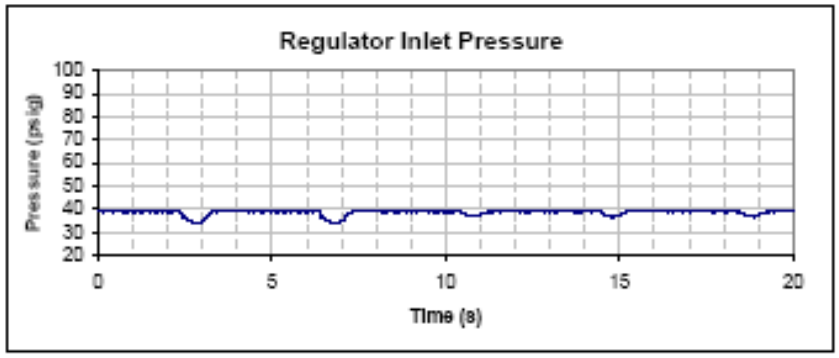
Group:	2 - Varied Inlet Pressure	Settings				Altitude	GL
Test #:	5	Breathing Rate (bpm)	15	Minute Volume (l)	20	Inlet Pressure (psig)	40
		Stroke Volume (l)	1.33	Peak Inspired Flow (lpm)	120	Regulator Mode	Dilution

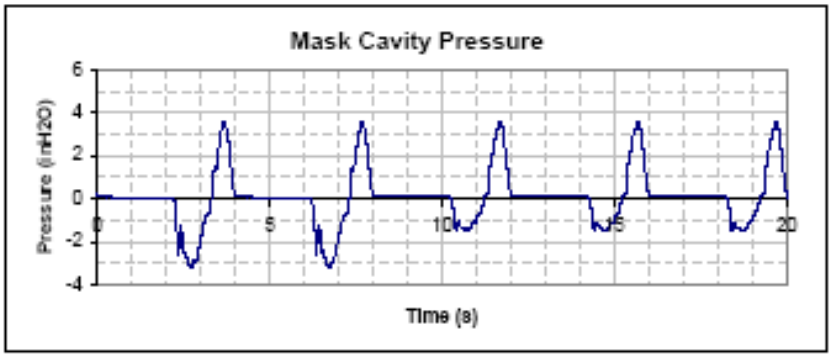






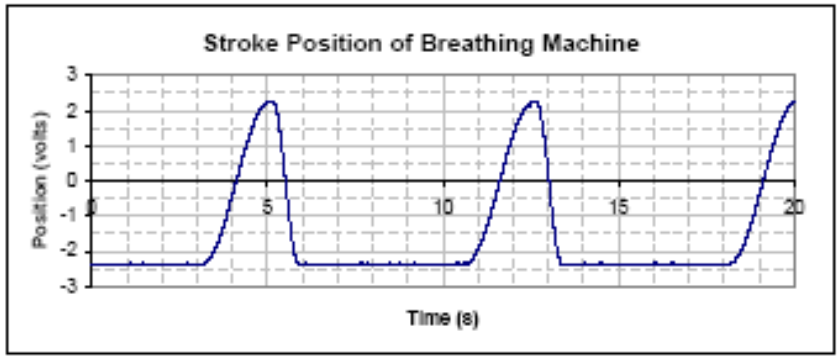


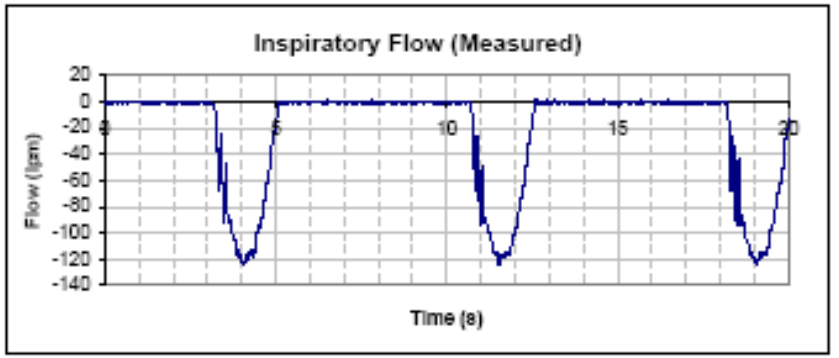


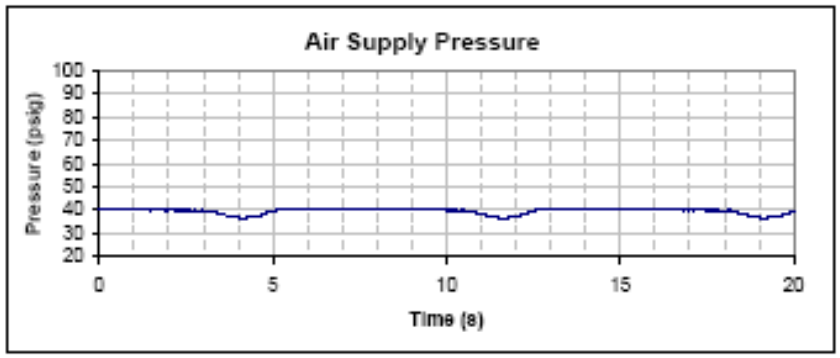


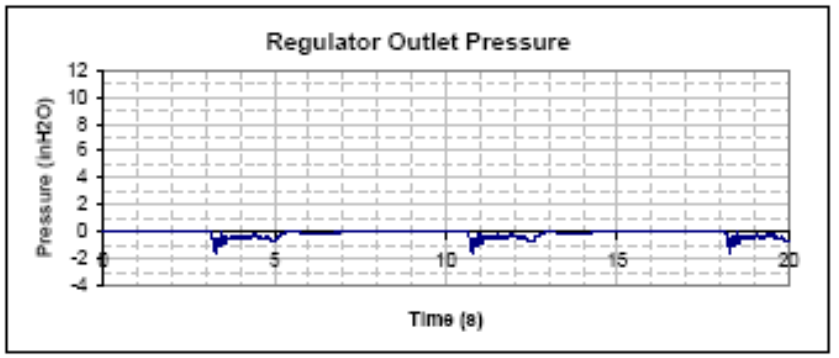
CF188 Oxygen System Compatability Test - NACES Configuration

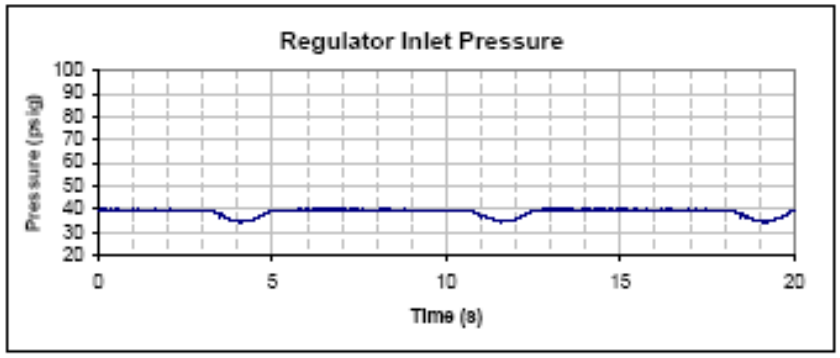
Group:	2 - Varied Inlet Pressure	Settings				Altitude	GL
Test #:	6	Breathing Rate (bpm)	8	Minute Volume (l)	20	Inlet Pressure (psig)	40
		Stroke Volume (l)	2.5	Peak Inspired Flow (lpm)	120	Regulator Mode	Dilution

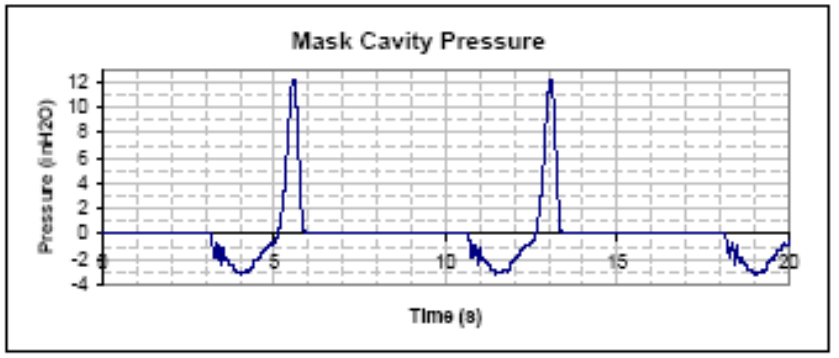






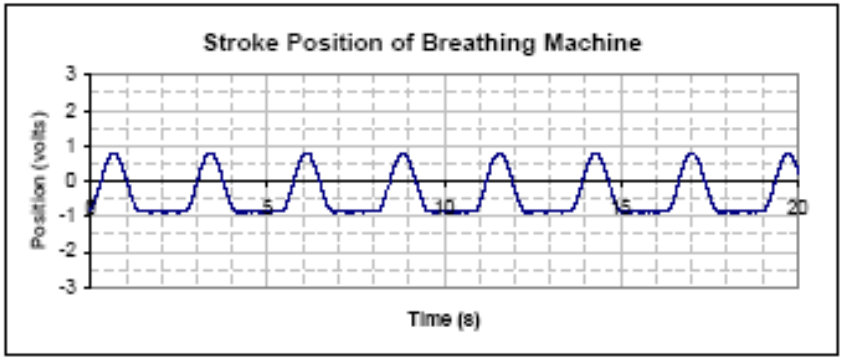


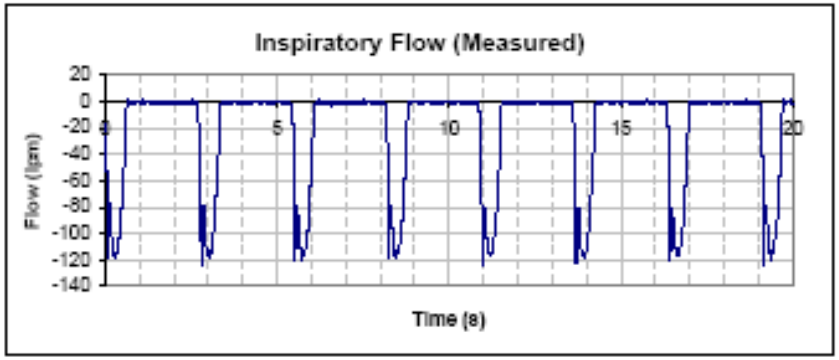


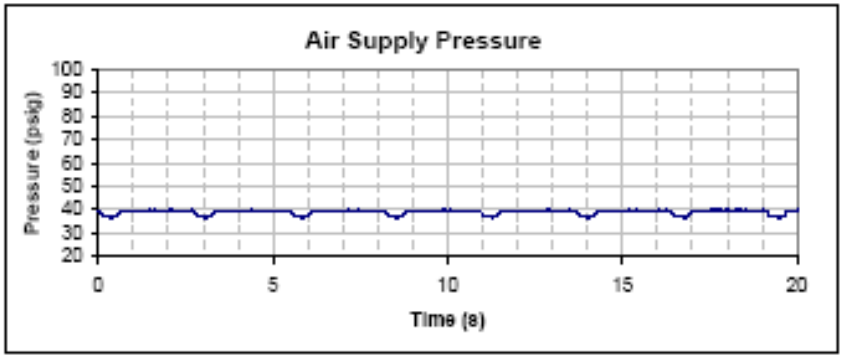


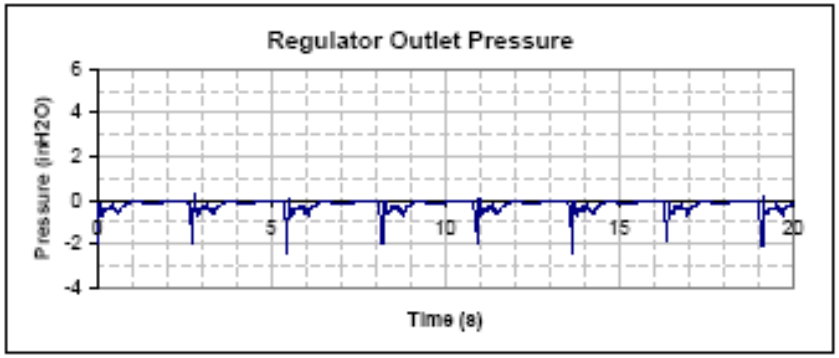
CF188 Oxygen System Compatability Test - NACES Configuration

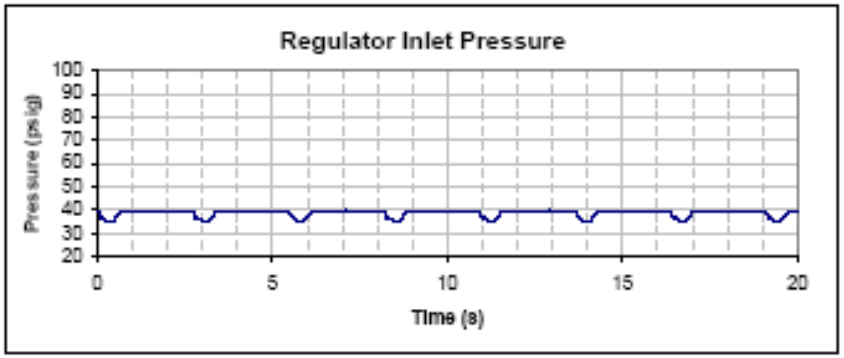
Group:	2 - Varied Inlet Pressure	Settings				Altitude	GL
Test #:	7	Breathing Rate (bpm)	22	Minute Volume (l)	20	Inlet Pressure (psig)	40
		Stroke Volume (l)	0.91	Peak Inspired Flow (lpm)	120	Regulator Mode	Dilution

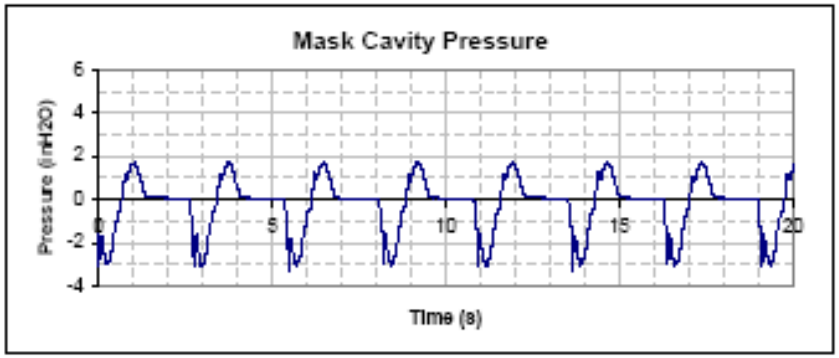






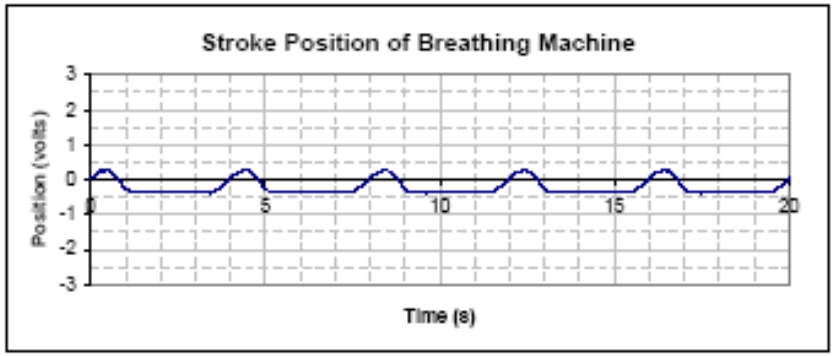


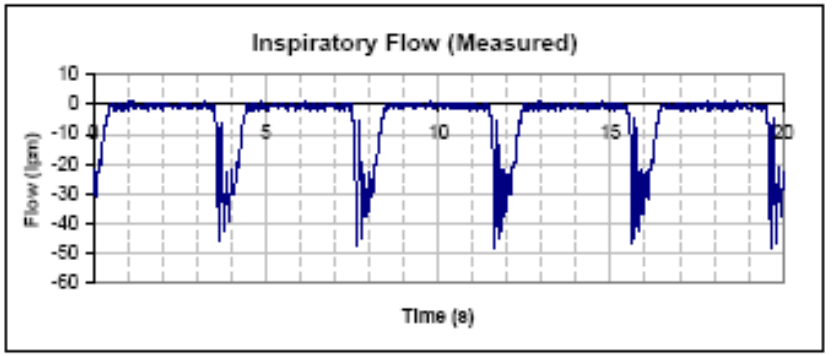


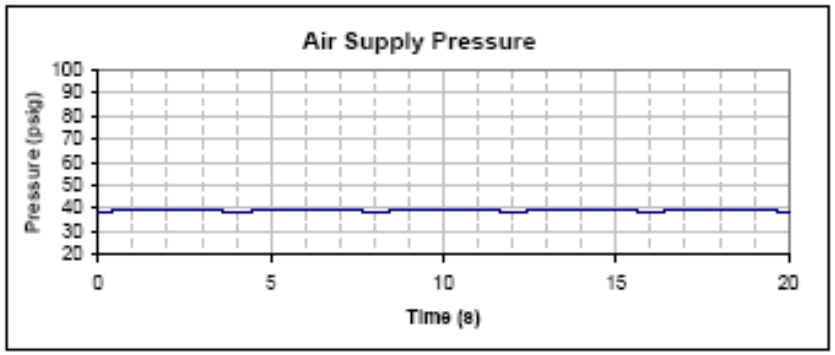


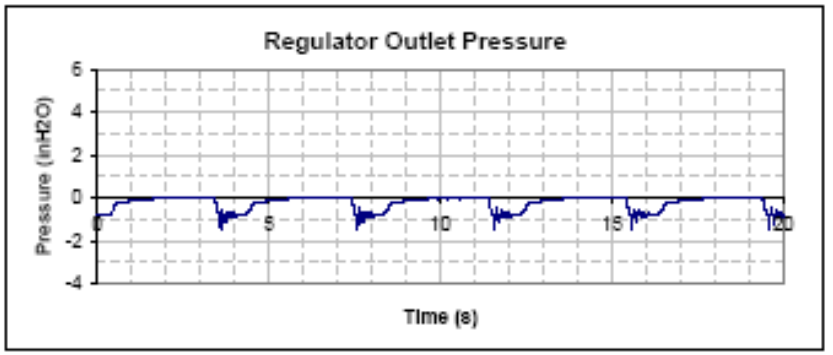
CF188 Oxygen System Compatability Test - NACES Configuration

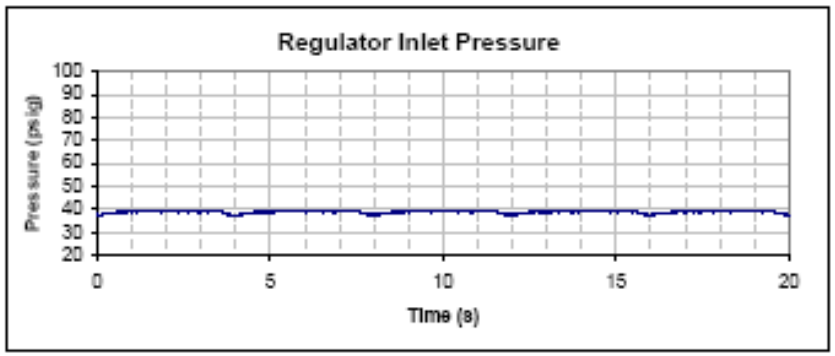
Group:	2 - Varied Inlet Pressure	Settings				Altitude	GL
Test #:	8	Breathing Rate (bpm)	15	Minute Volume (l)	5	Inlet Pressure (psig)	40
		Stroke Volume (l)	0.33	Peak Inspired Flow (lpm)	30	Regulator Mode	Dilution

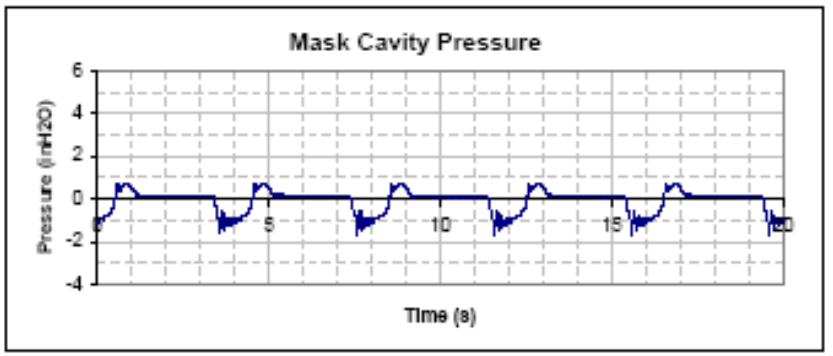






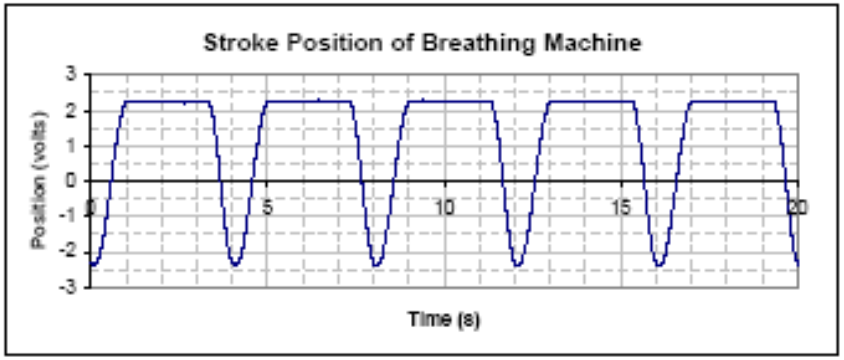


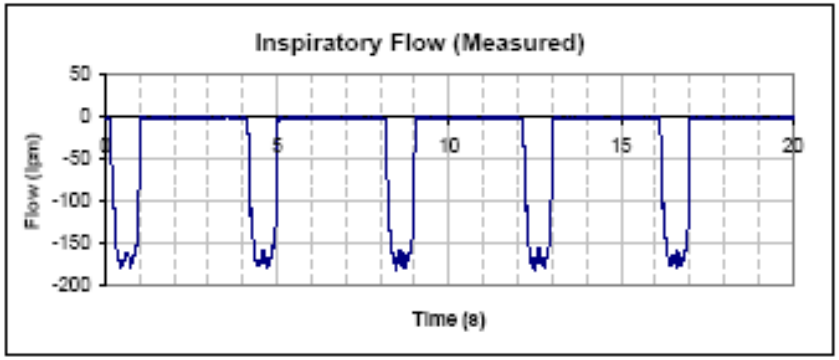


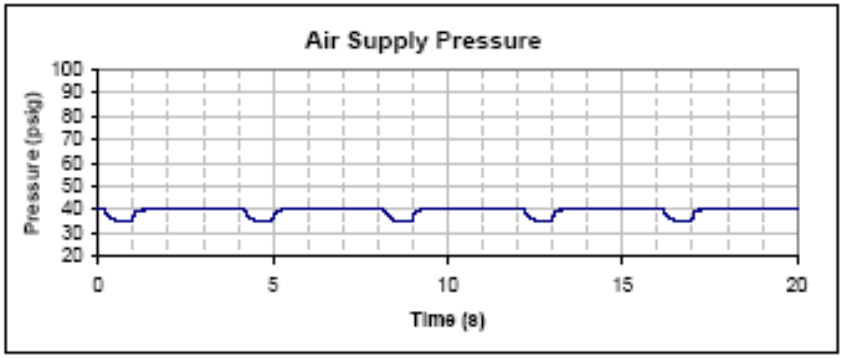


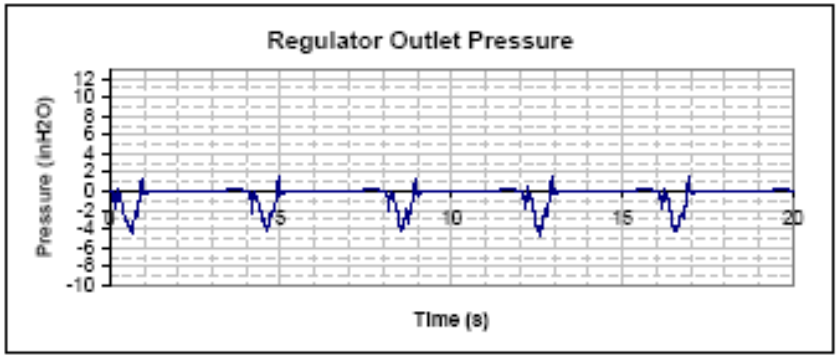
CF188 Oxygen System Compatability Test - NACES Configuration

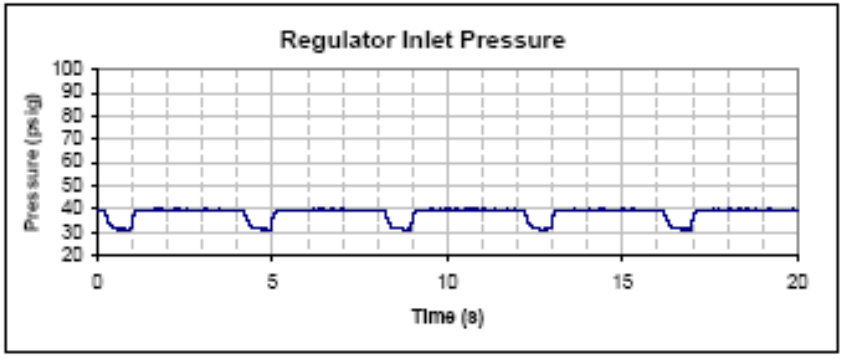
Group: 2 - Varied Inlet Pressure	Settings			Altitude	GL
Test #: 9	Breathing Rate (bpm)	15	Minute Volume (l) 37.5	Inlet Pressure (psig)	40
	Stroke Volume (l)	2.5	Peak Inspired Flow (lpm) 250	Regulator Mode	Dilution

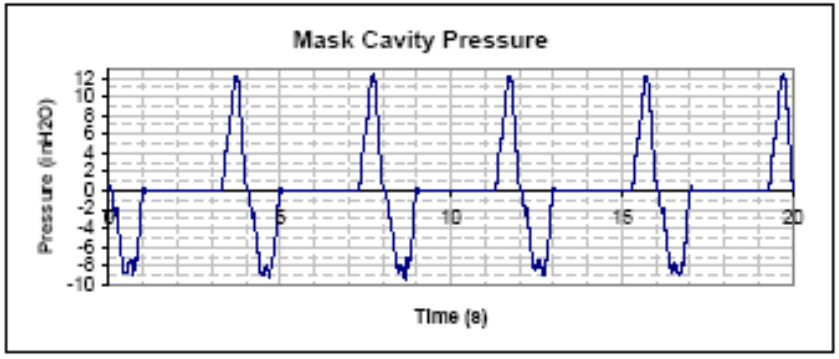






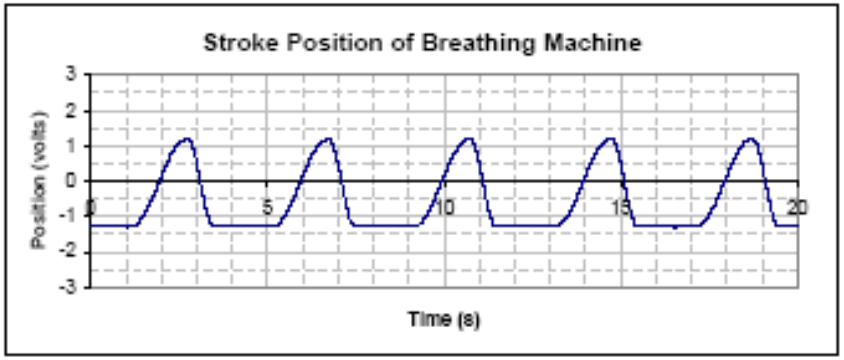


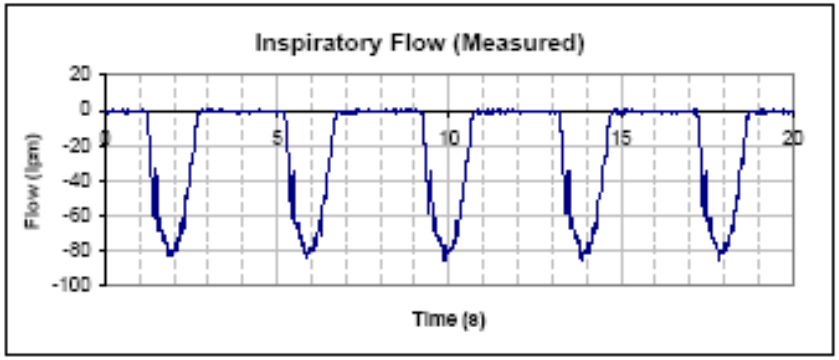


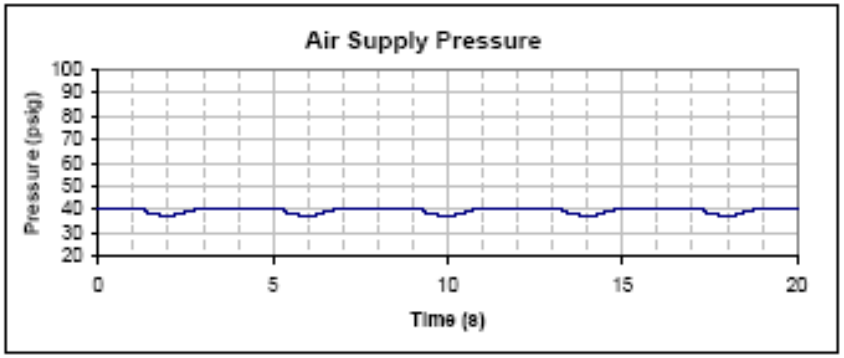


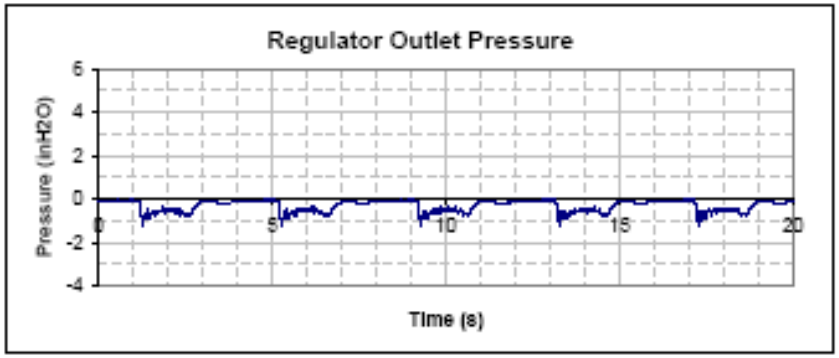
CF188 Oxygen System Compatability Test - NACES Configuration

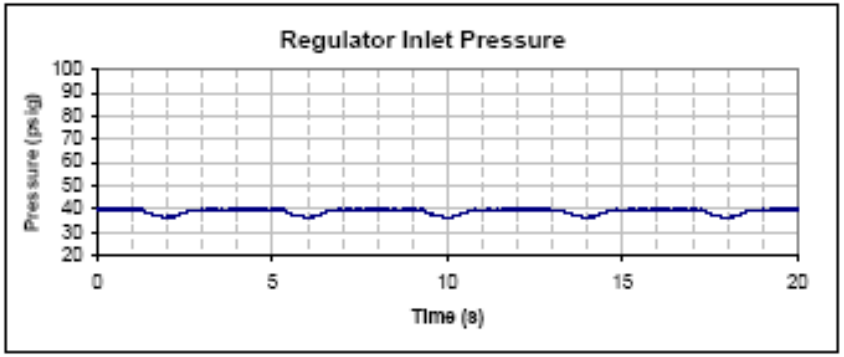
Group:	2 - Varied Inlet Pressure	Settings				Altitude	GL
Test #:	10	Breathing Rate (bpm)	15	Minute Volume (l)	20	Inlet Pressure (psig)	40
		Stroke Volume (l)	1.33	Peak Inspired Flow (lpm)	80	Regulator Mode	Dilution

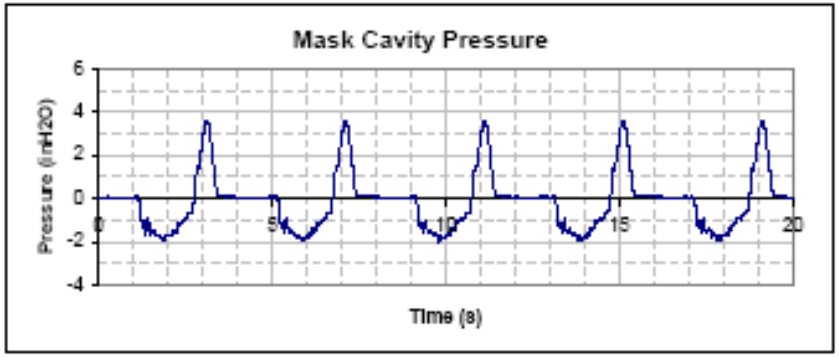






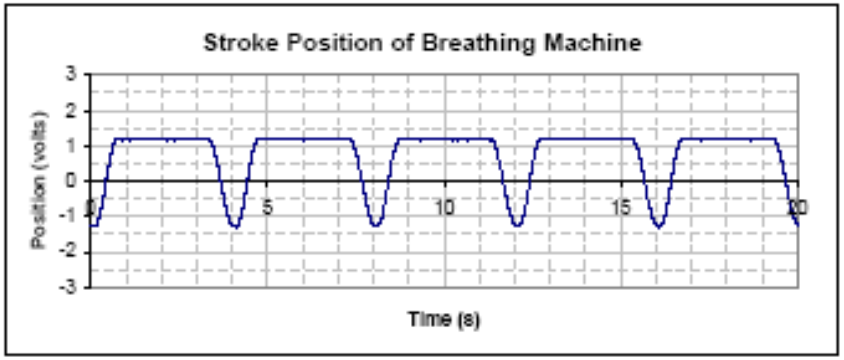


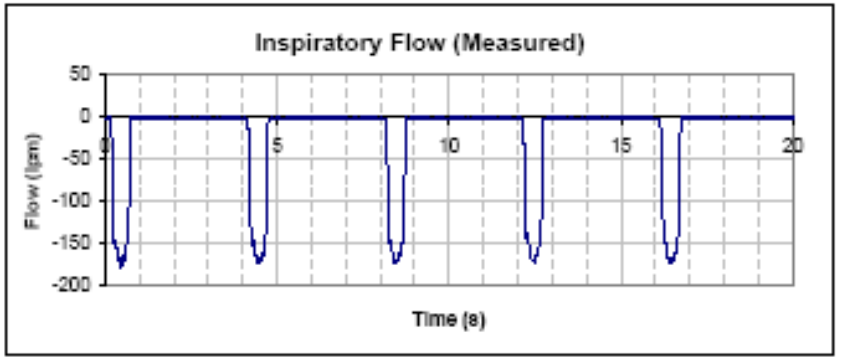


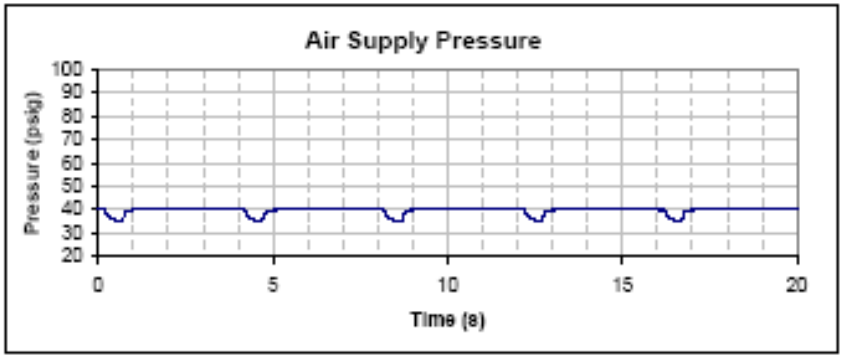


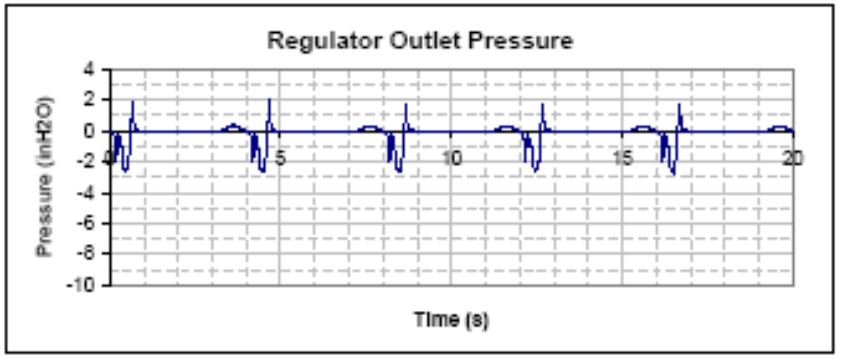
CF188 Oxygen System Compatability Test - NACES Configuration

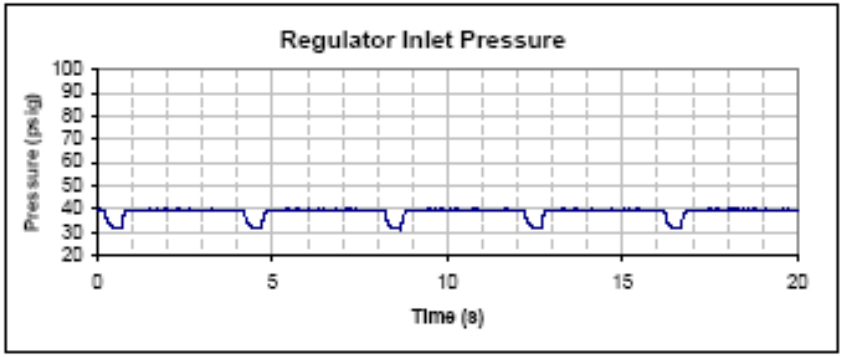
Group: 2 - Varied Inlet Pressure	Settings					Altitude	GL
Test #: 11	Breathing Rate (bpm)	15	Minute Volume (l)	20		Inlet Pressure (psig)	40
	Stroke Volume (l)	1.33	Peak Inspired Flow (lpm)	200		Regulator Mode	normal

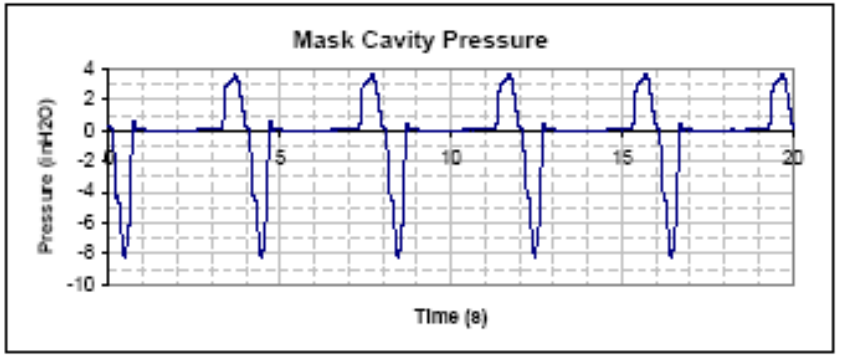






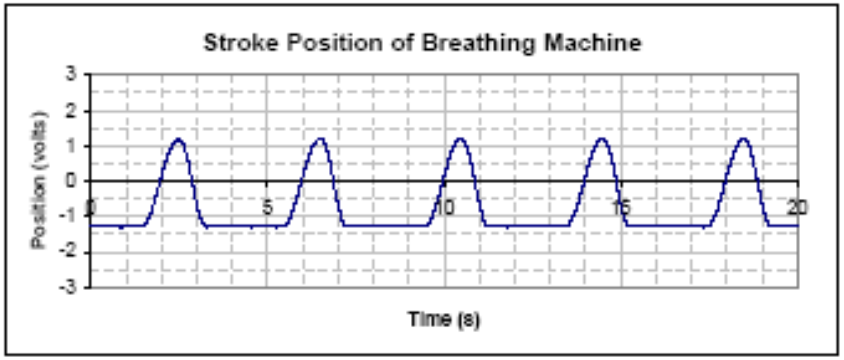


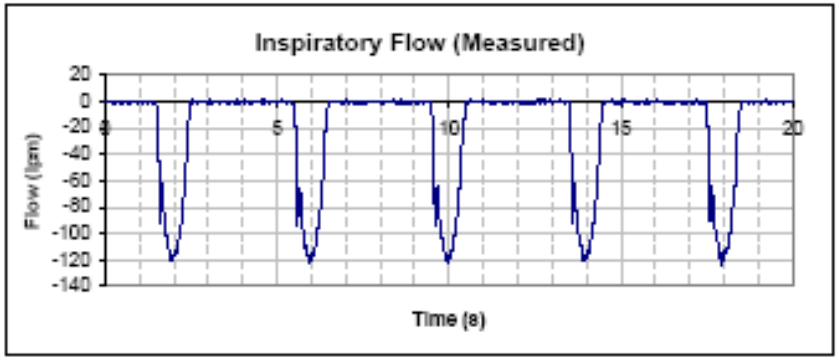


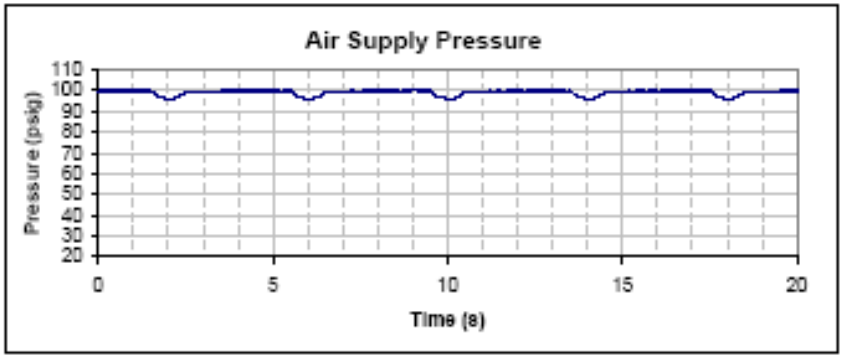


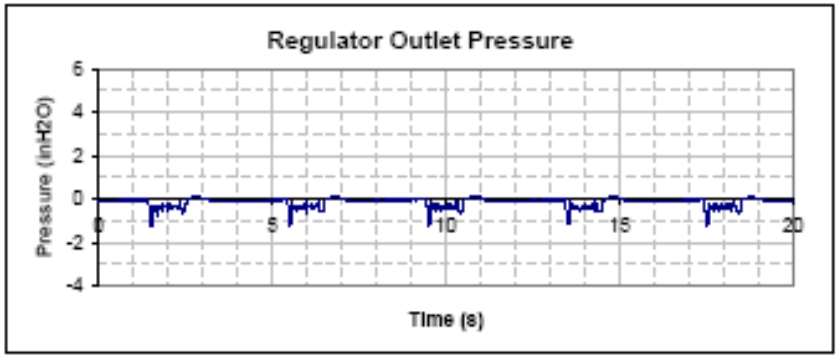
CF188 Oxygen System Compatability Test - NACES Configuration

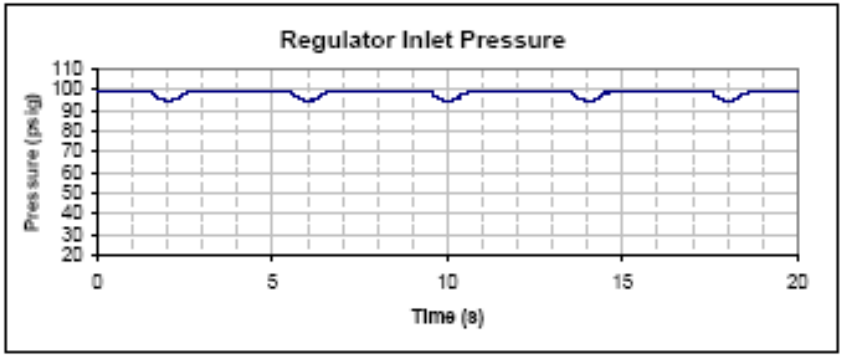
Group: 2 - Varied Inlet Pressure		Settings				Altitude	GL
Test #:	12	Breathing Rate (bpm)	15	Minute Volume (l)	20	Inlet Pressure (psig)	100
		Stroke Volume (l)	1.33	Peak Inspired Flow (lpm)	120	Regulator Mode	Dilution

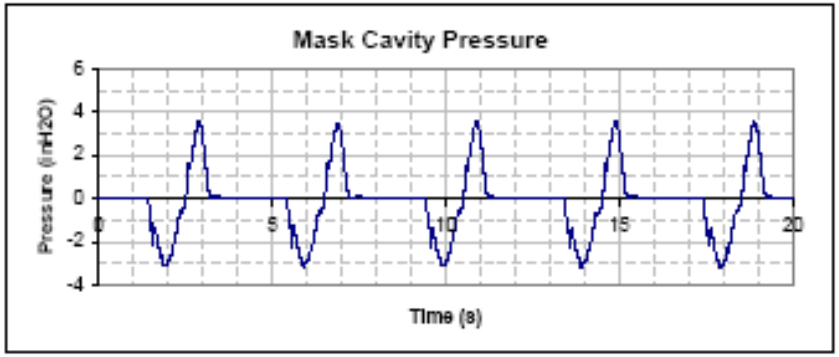






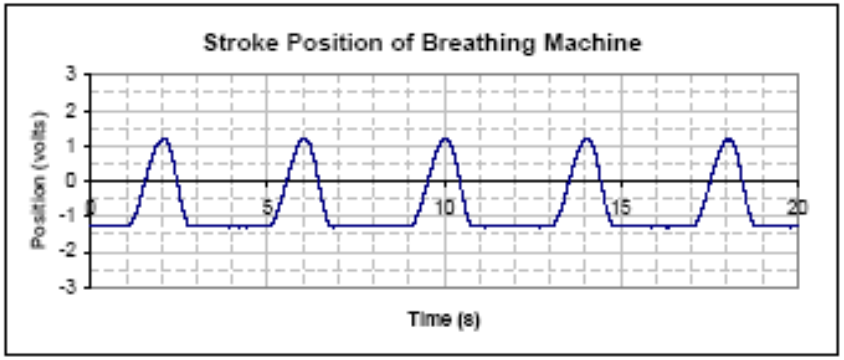


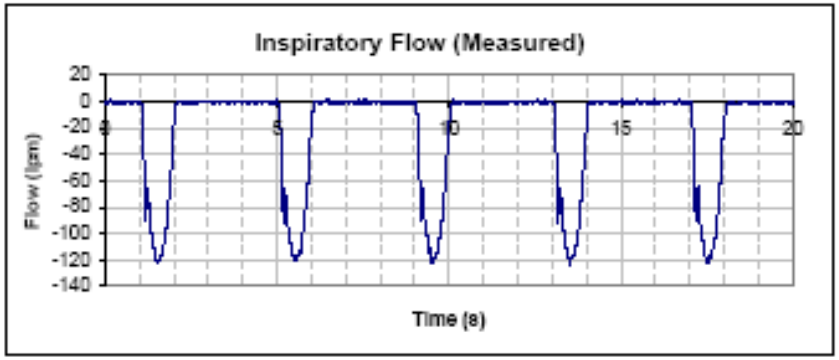


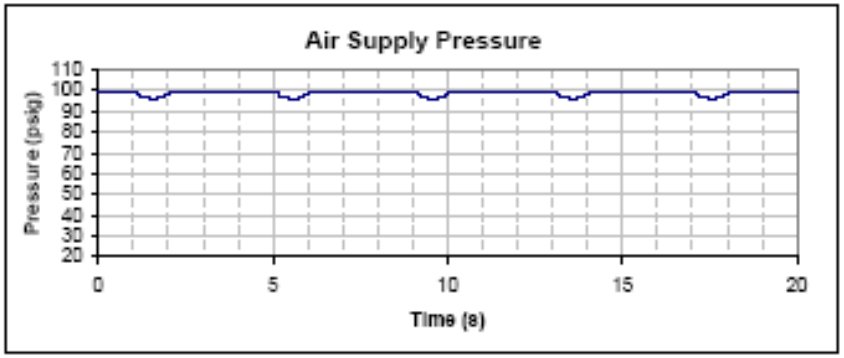


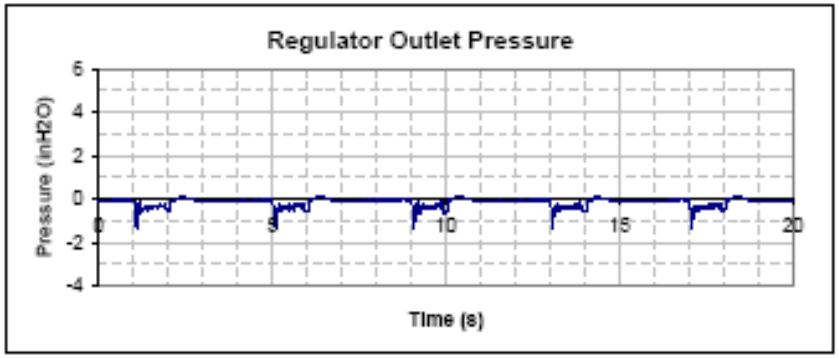
CF188 Oxygen System Compatability Test - NACES Configuration

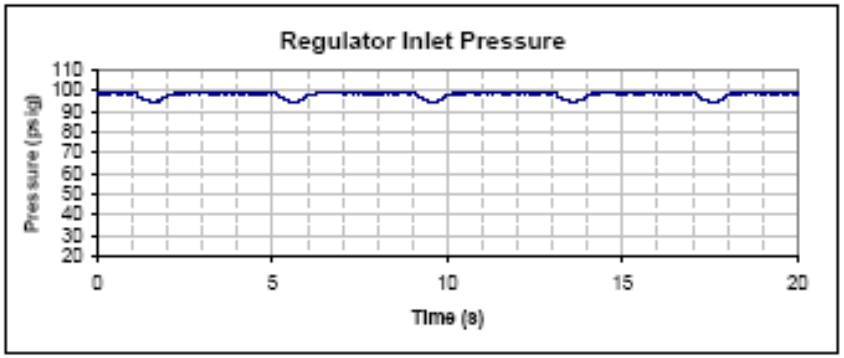
Group: 2 - Varied Inlet Pressure		Settings				Altitude	GL
Test #:	13	Breathing Rate (bpm)	15	Minute Volume (l)	20	Inlet Pressure (psig)	100
		Stroke Volume (l)	1.33	Peak Inspired Flow (lpm)	120	Regulator Mode	Dilution

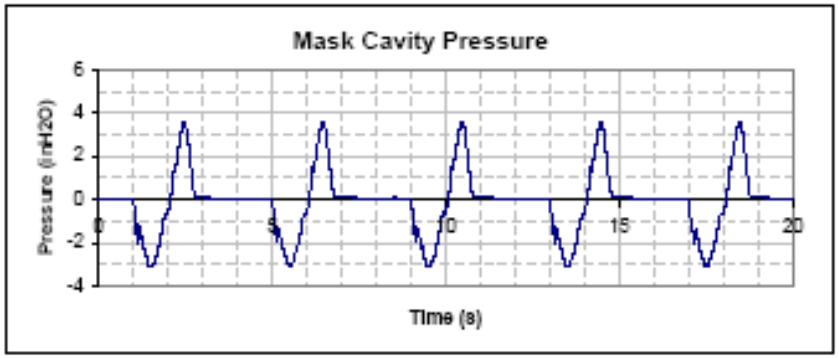






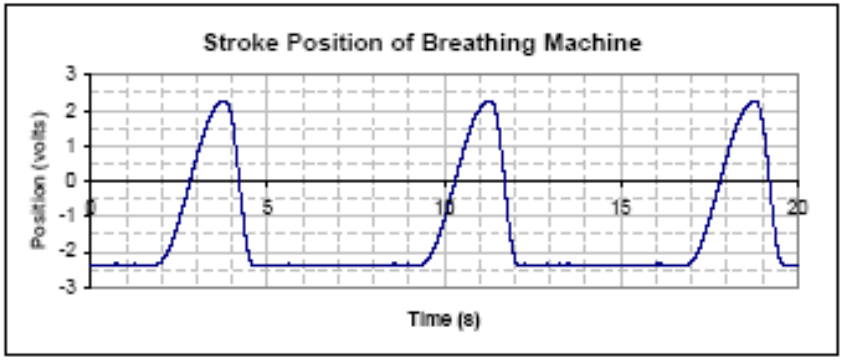


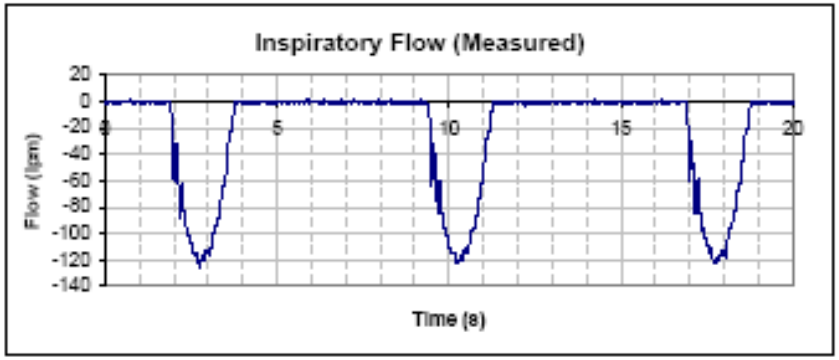


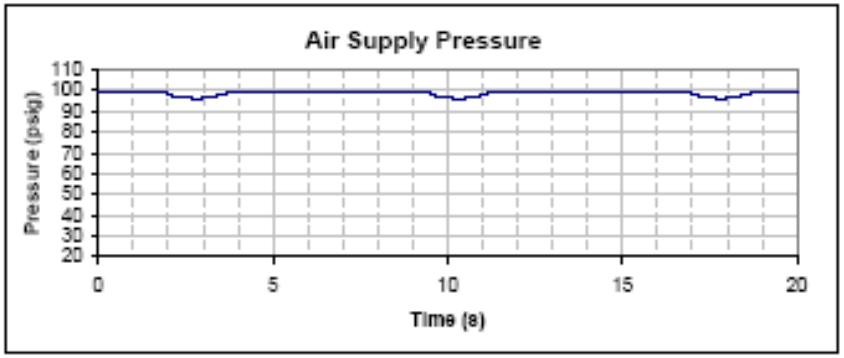


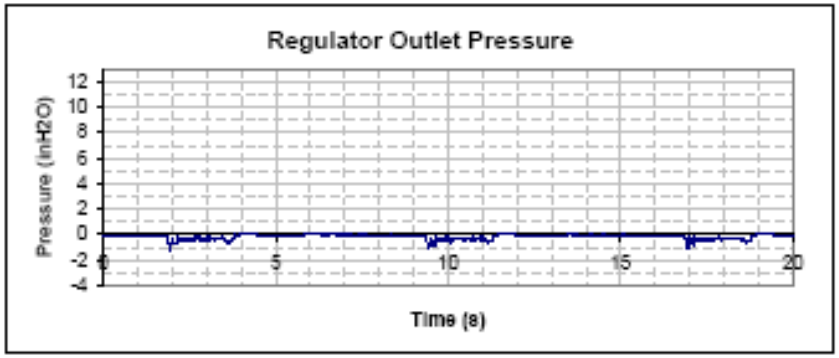
CF188 Oxygen System Compatability Test - NACES Configuration

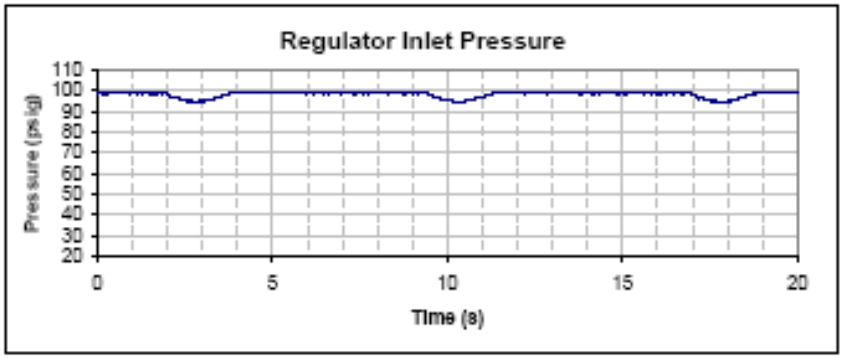
Group: 2 - Varied Inlet Pressure	Settings			Altitude	GL
Test #: 14	Breathing Rate (bpm)	8	Minute Volume (l) 20	Inlet Pressure (psig)	100
	Stroke Volume (l)	2.5	Peak Inspired Flow (lpm) 120	Regulator Mode	Dilution

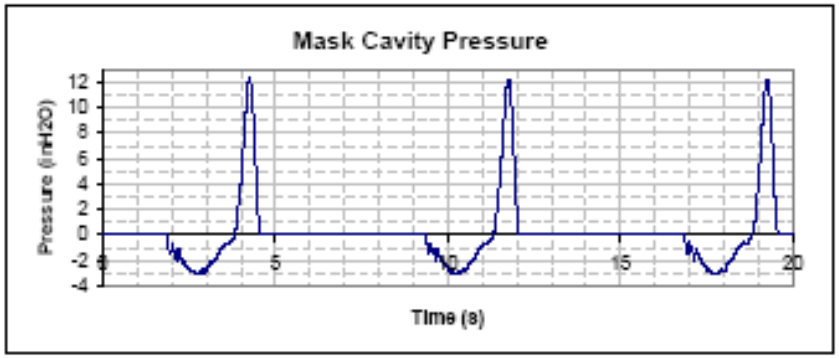






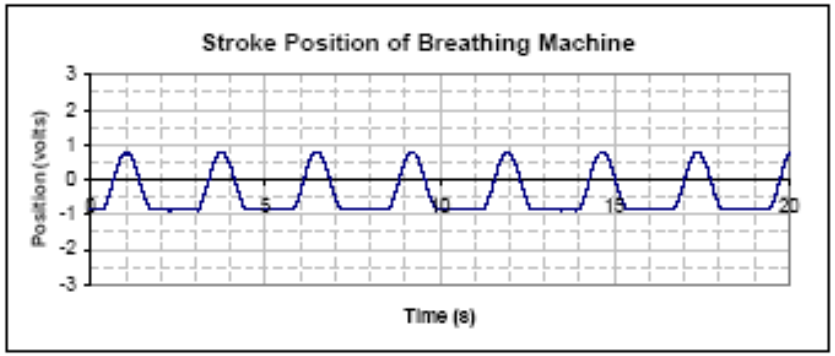


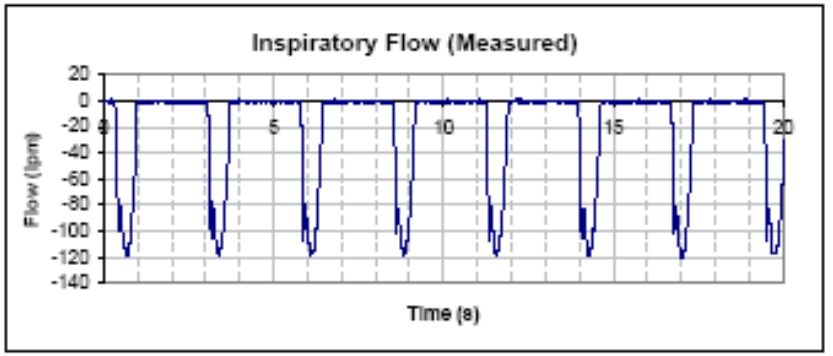


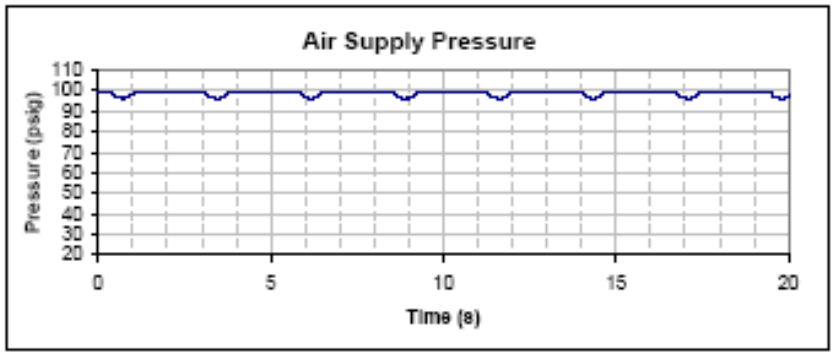


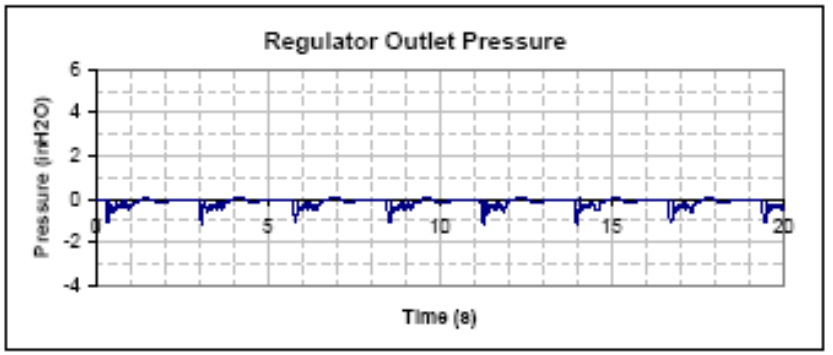
CF188 Oxygen System Compatability Test - NACES Configuration

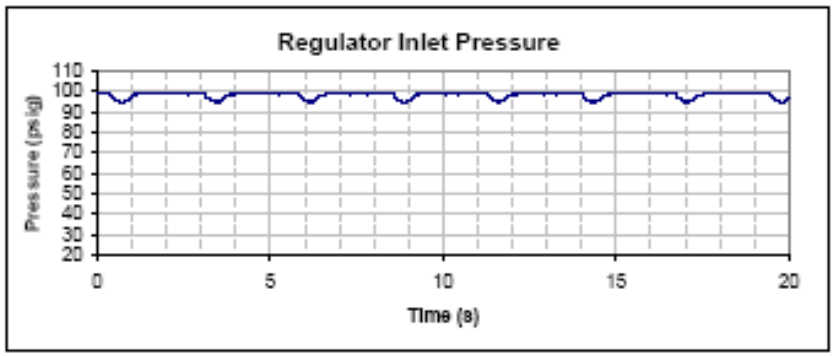
Group: 2 - Varied Inlet Pressure	Settings				Altitude	GL
Test #: 15	Breathing Rate (bpm)	22	Minute Volume (l)	20	Inlet Pressure (psig)	100
	Stroke Volume (l)	0.91	Peak Inspired Flow (lpm)	120	Regulator Mode	Dilution

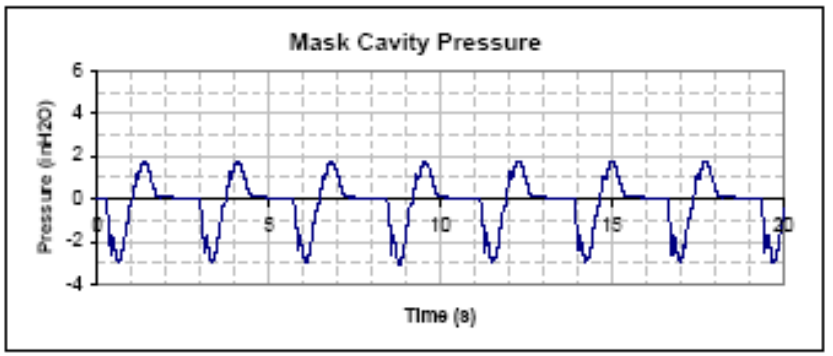






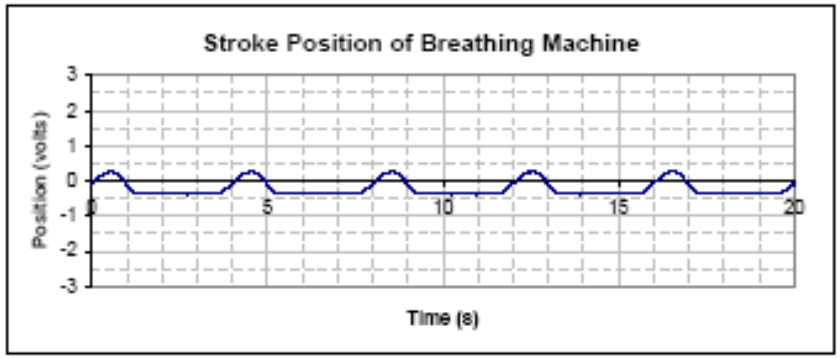


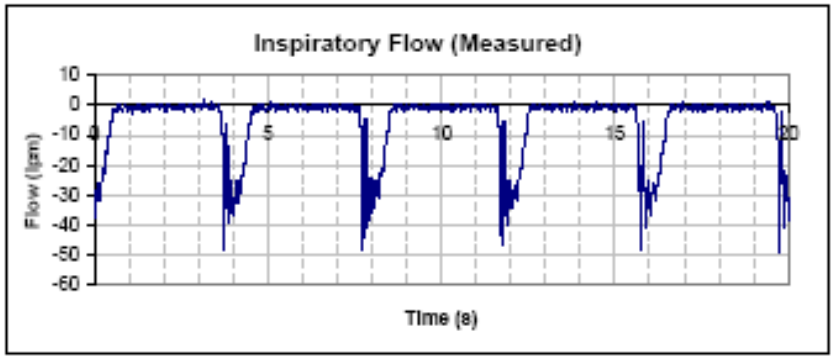


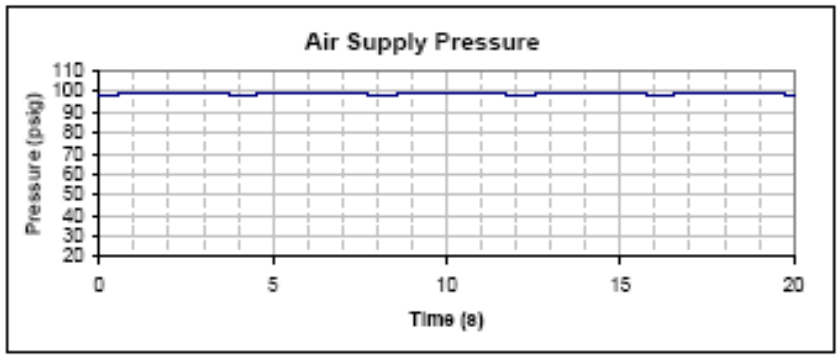


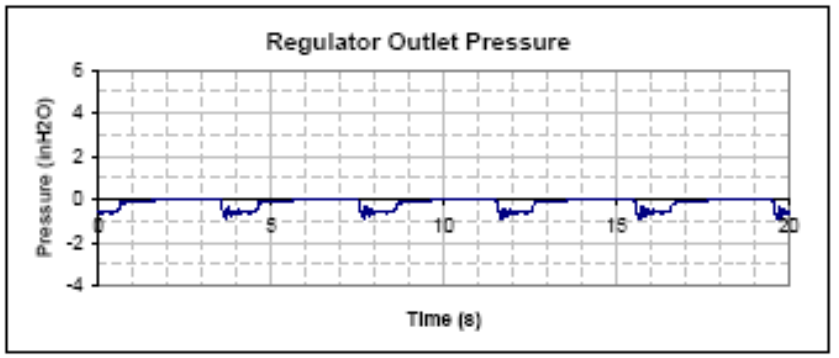
CF188 Oxygen System Compatability Test - NACES Configuration

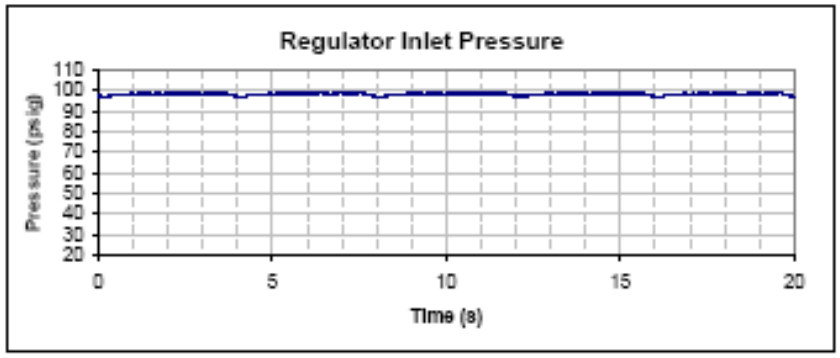
Group: 2 - Varied Inlet Pressure		Settings				Altitude	GL
Test #:	16	Breathing Rate (bpm)	15	Minute Volume (l)	5	Inlet Pressure (psig)	100
		Stroke Volume (l)	0.33	Peak Inspired Flow (lpm)	30	Regulator Mode	Dilution

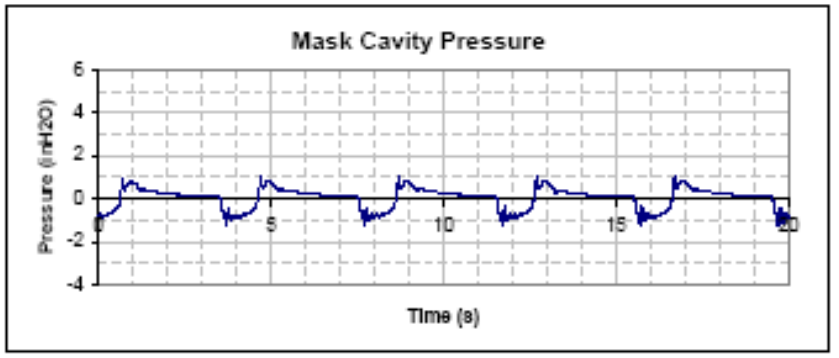






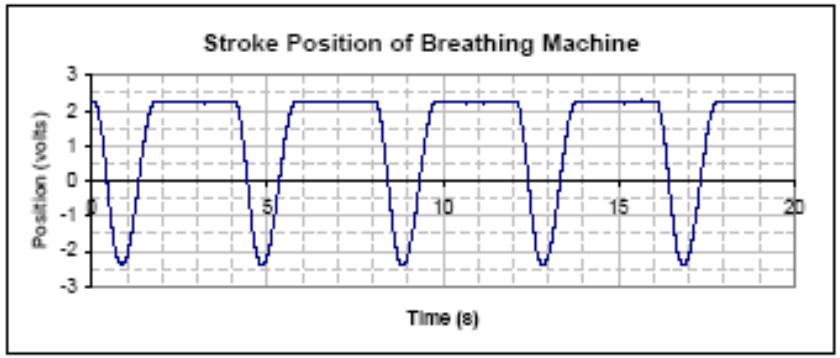


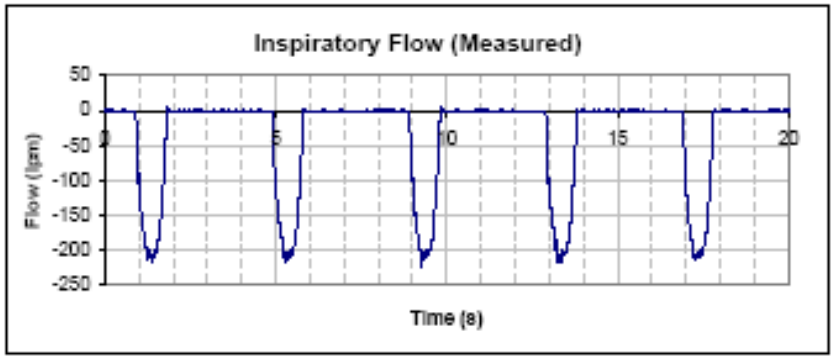


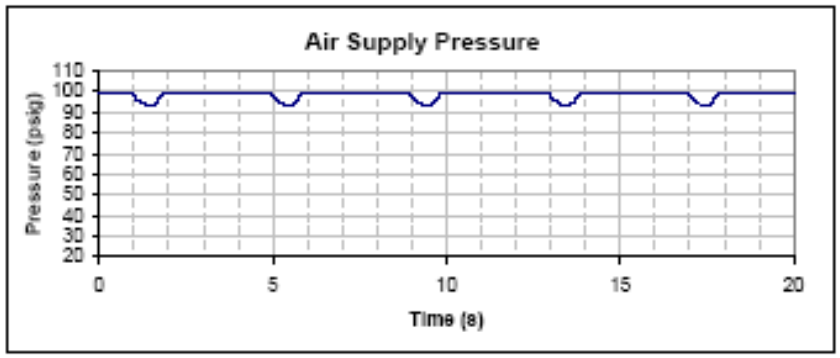


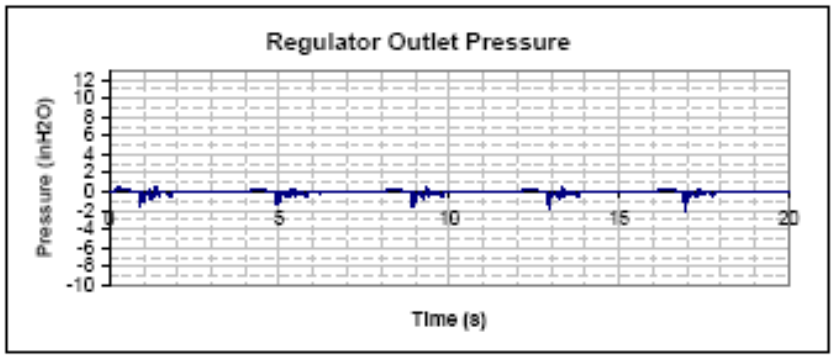
CF188 Oxygen System Compatability Test - NACES Configuration

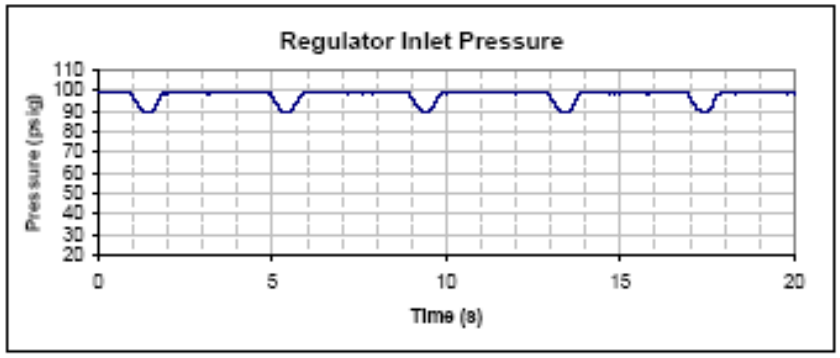
Group: 2 - Varied Inlet Pressure		Settings				Altitude	GL
Test #:	17	Breathing Rate (bpm)	15	Minute Volume (l)	37.5	Inlet Pressure (psig)	100
		Stroke Volume (l)	2.5	Peak Inspired Flow (lpm)	250	Regulator Mode	Dilution

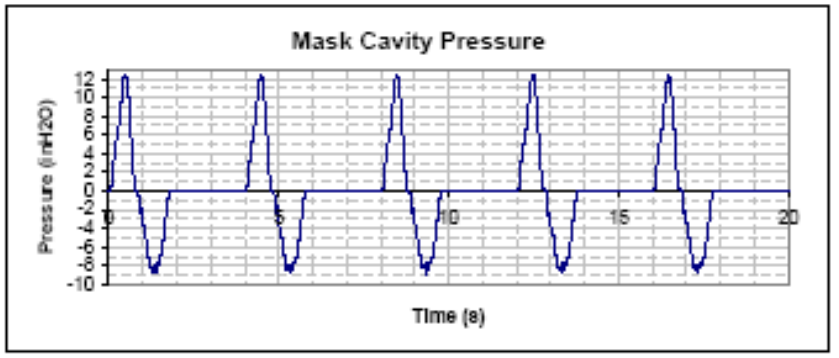






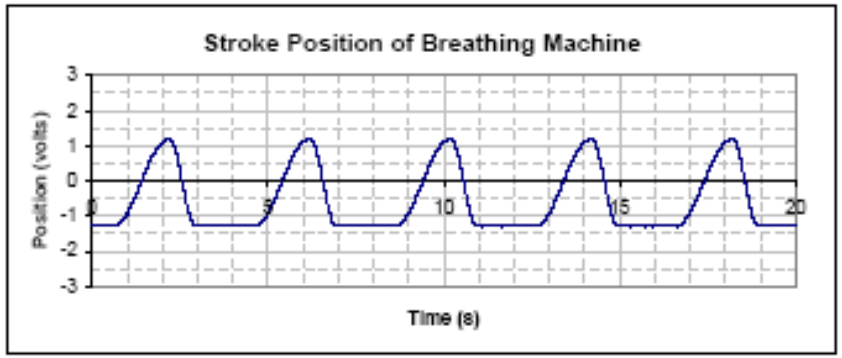


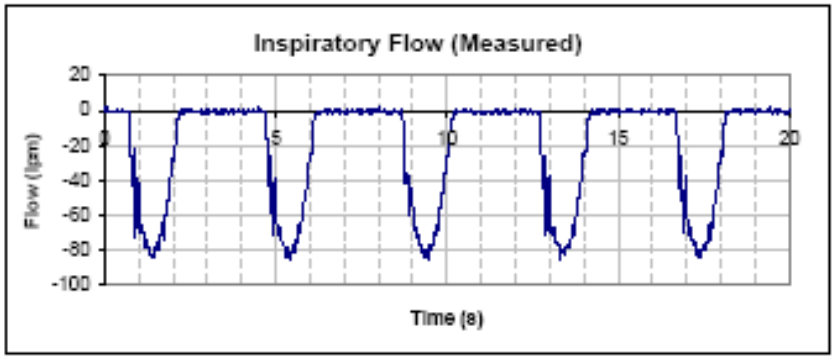


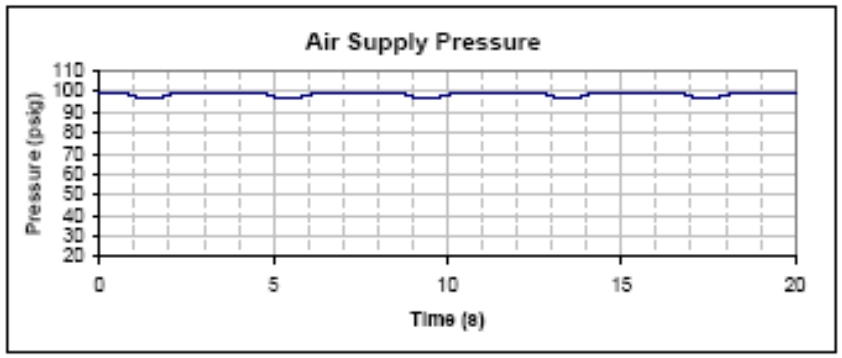


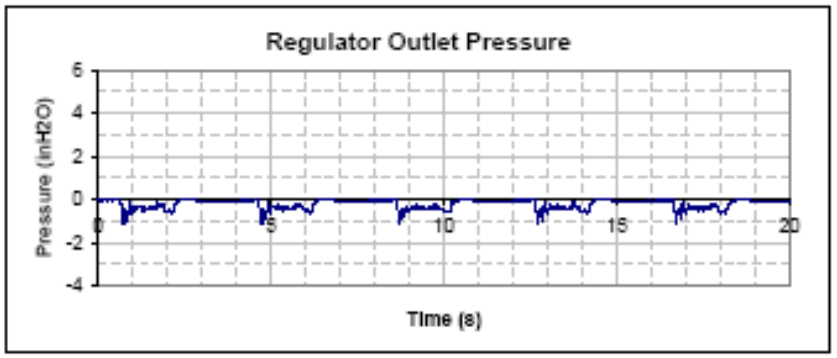
CF188 Oxygen System Compatability Test - NACES Configuration

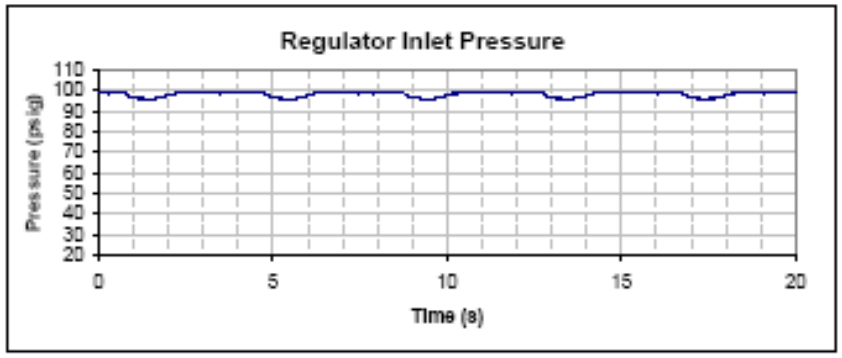
Group: 2 - Varied Inlet Pressure		Settings				Altitude	GL
Test #:	18	Breathing Rate (bpm)	15	Minute Volume (l)	20	Inlet Pressure (psig)	100
		Stroke Volume (l)	1.33	Peak Inspired Flow (lpm)	80	Regulator Mode	Dilution

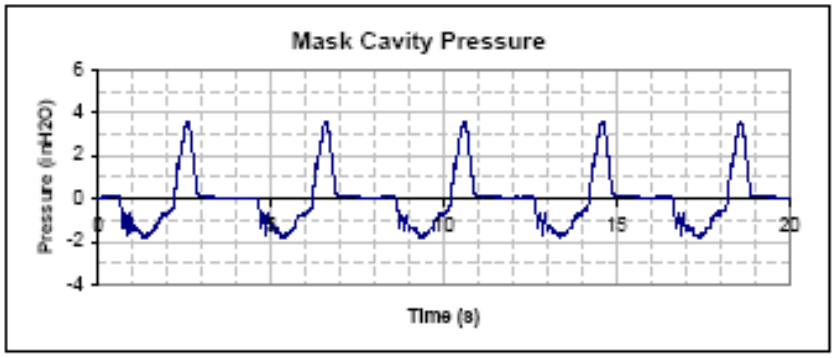






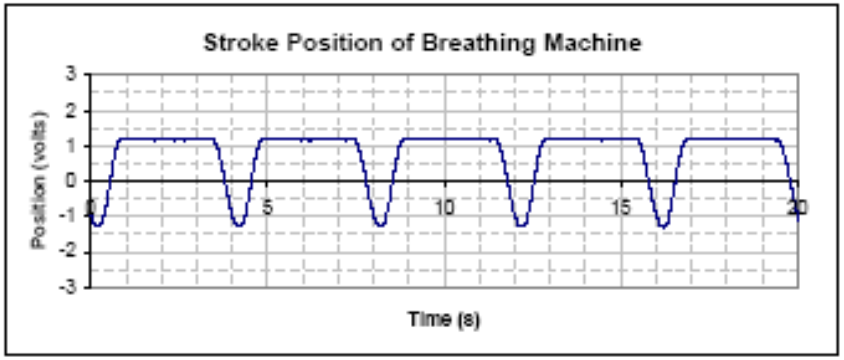


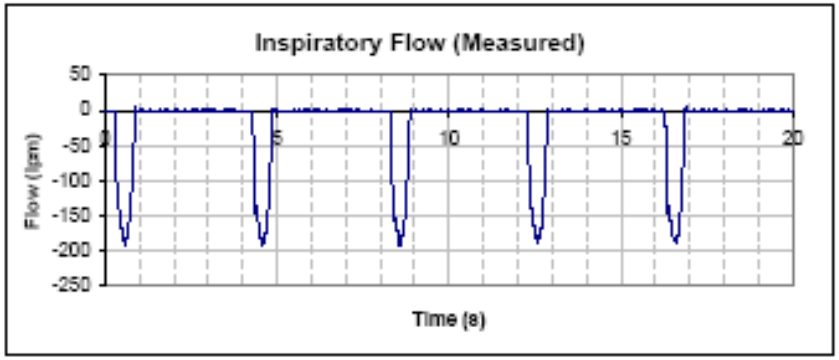


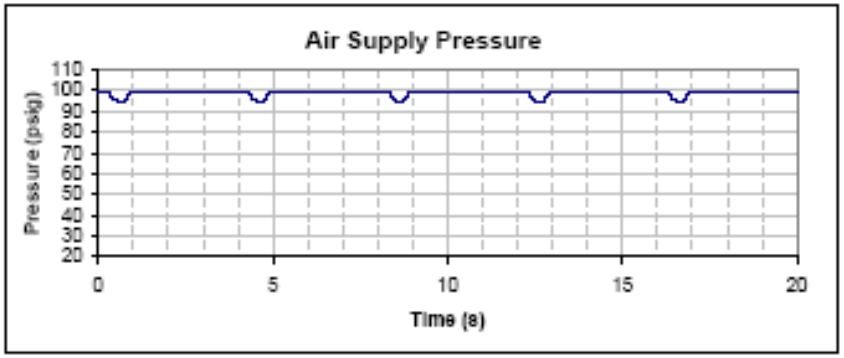


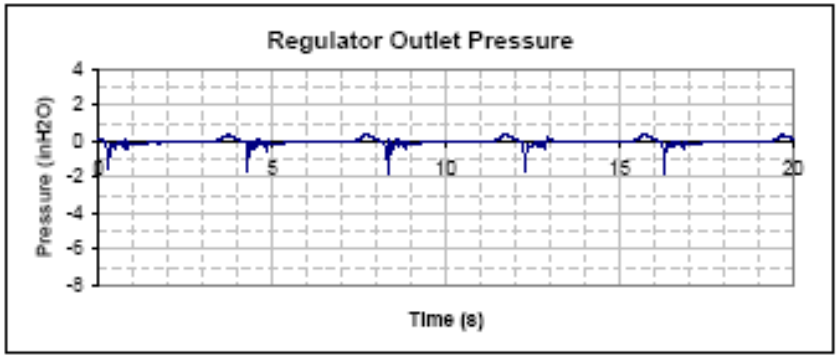
CF188 Oxygen System Compatability Test - NACES Configuration

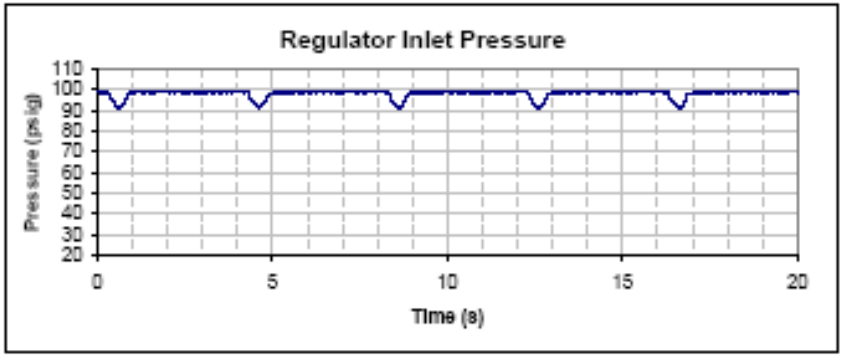
Group: 2 - Varied Inlet Pressure	Settings				Altitude	GL
Test #: 19	Breathing Rate (bpm)	15	Minute Volume (l)	20	Inlet Pressure (psig)	100
	Stroke Volume (l)	1.33	Peak Inspired Flow (lpm)	200	Regulator Mode	Dilution

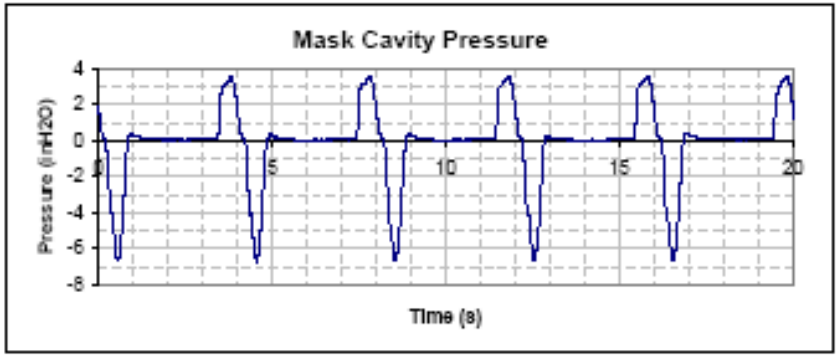






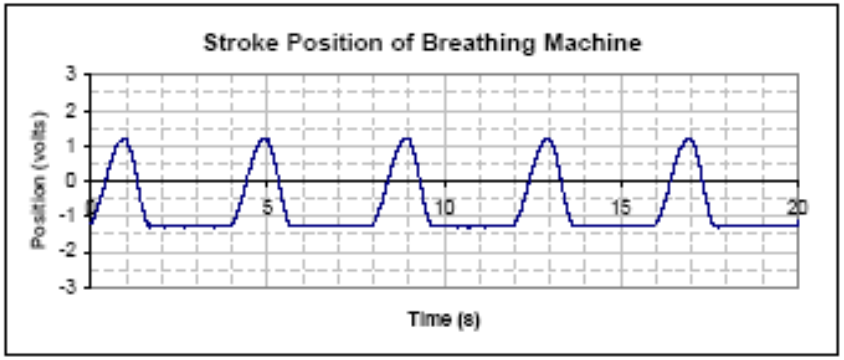


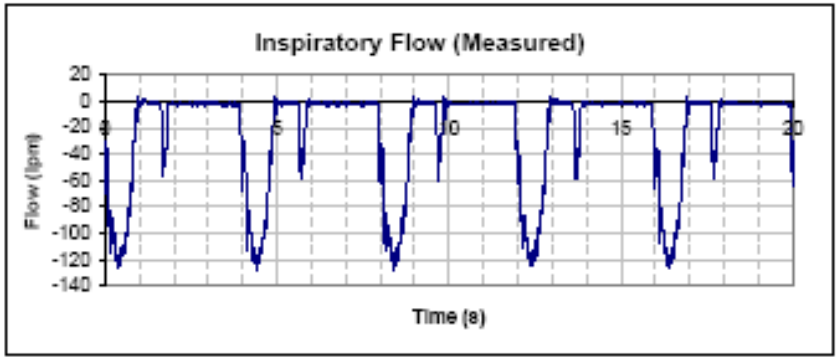


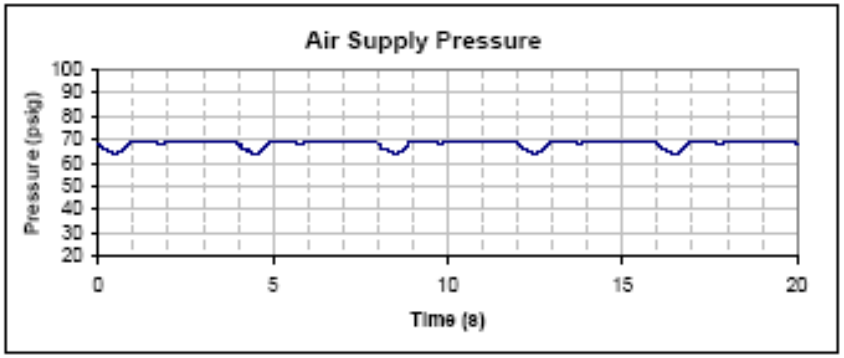


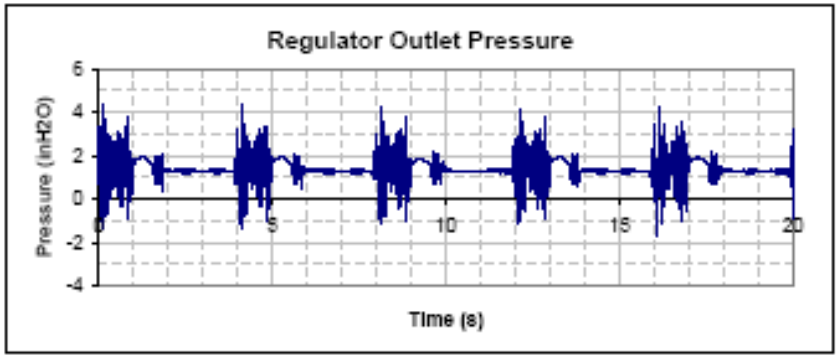
CF188 Oxygen System Compatability Test - NACES Configuration

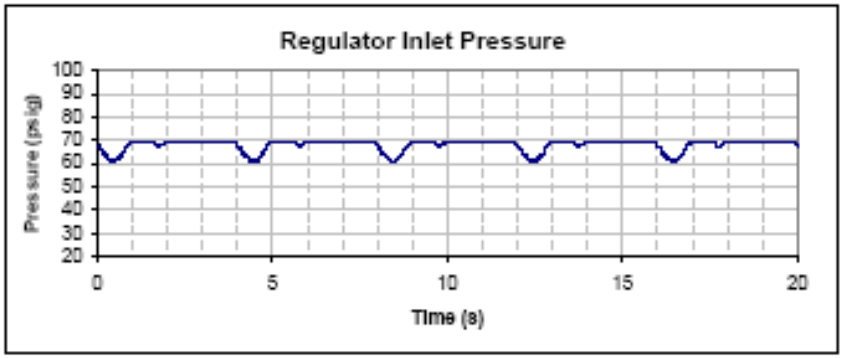
Group:	3 - Varied Mode	Settings				Altitude	GL
Test #:	20	Breathing Rate (bpm)	15	Minute Volume (l)	20	Inlet Pressure (psig)	70
		Stroke Volume (l)	1.33	Peak Inspired Flow (lpm)	120	Regulator Mode	100%

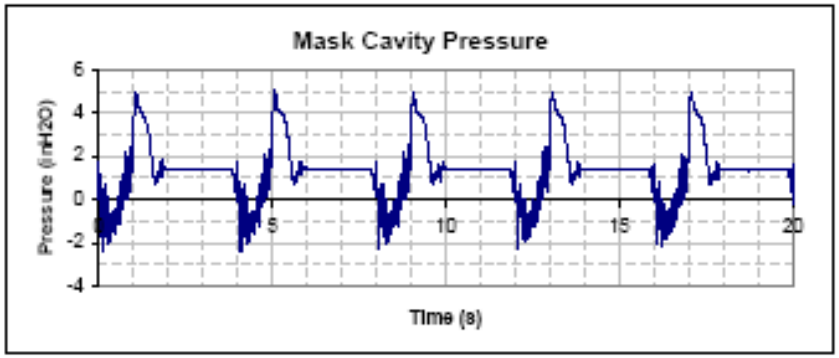






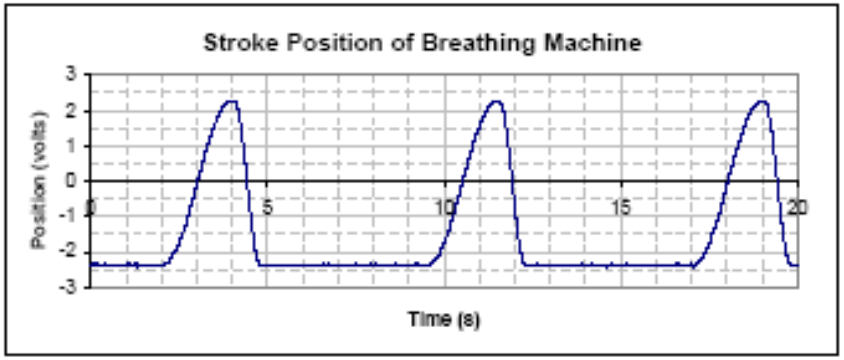


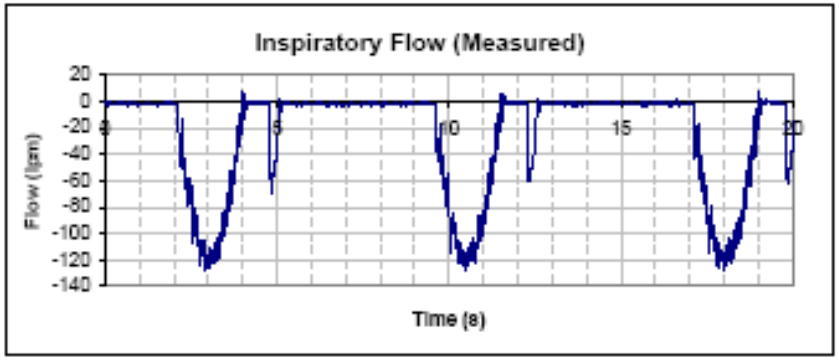


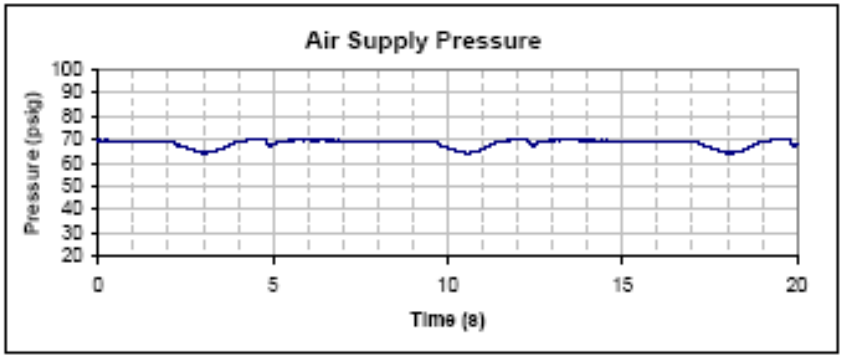


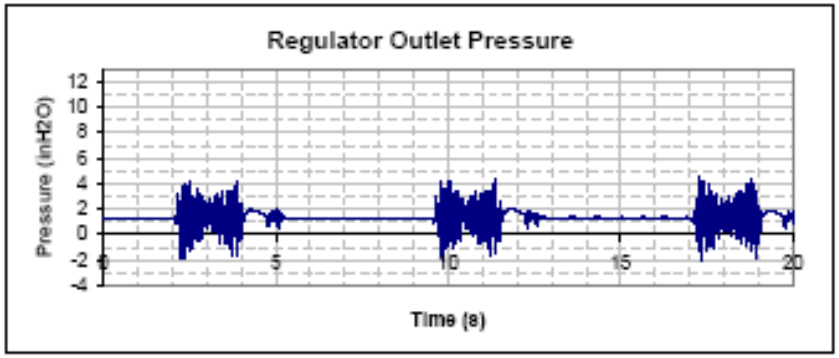
CF188 Oxygen System Compatability Test - NACES Configuration

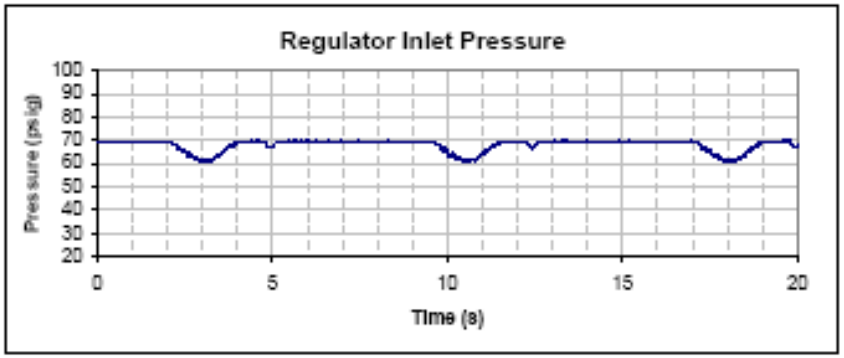
Group: 3 - Varied Mode	Settings			Altitude	GL
Test #: 21	Breathing Rate (bpm)	8	Minute Volume (l) 20	Inlet Pressure (psig)	70
	Stroke Volume (l)	2.5	Peak Inspired Flow (lpm) 120	Regulator Mode	100%

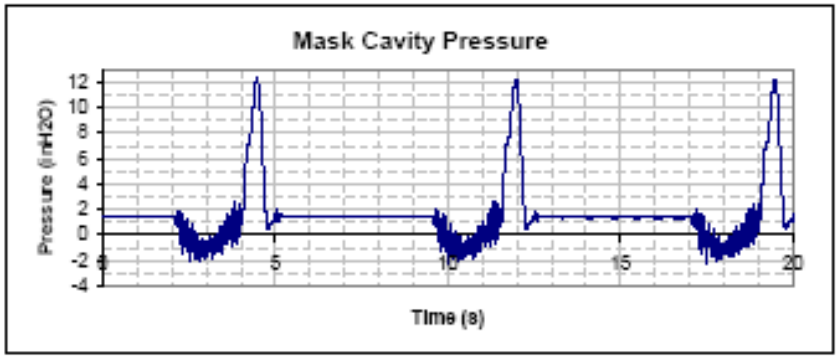






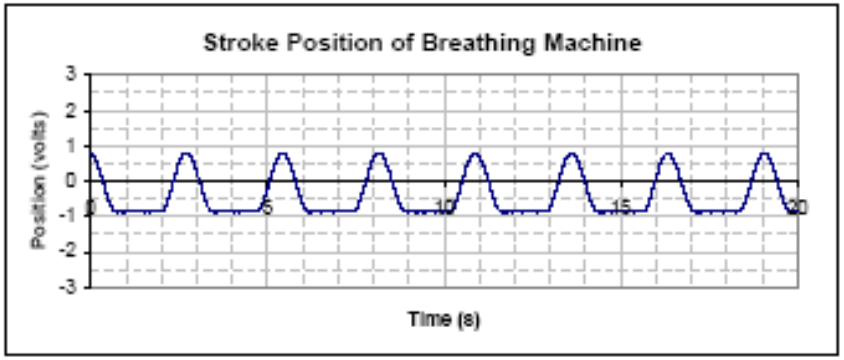


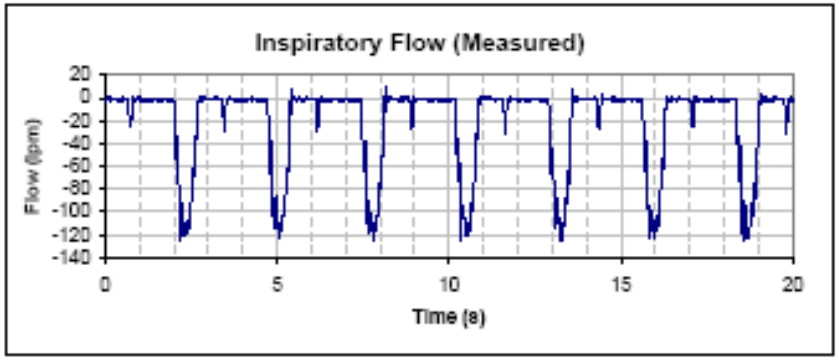


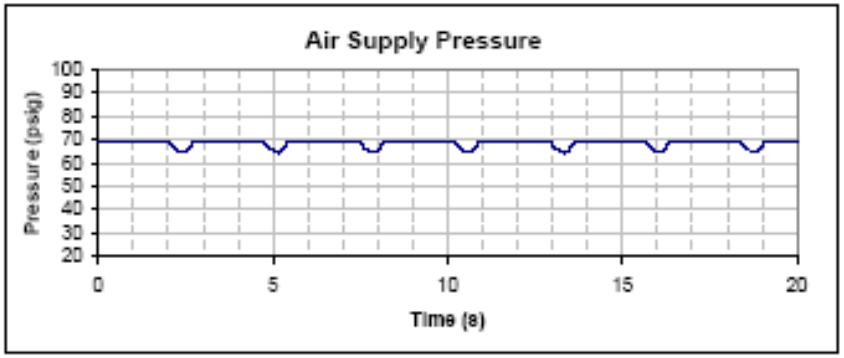


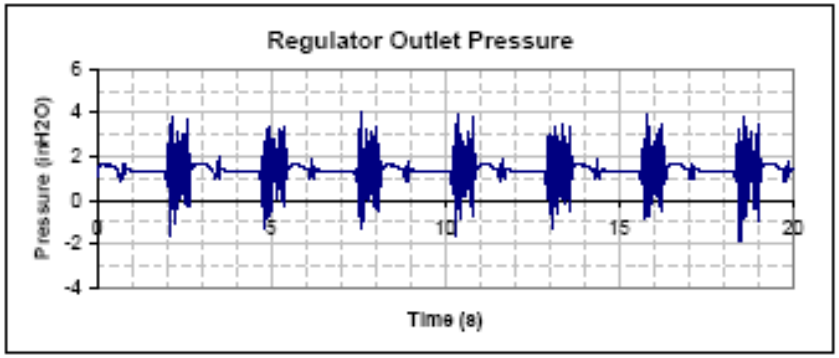
CF188 Oxygen System Compatability Test - NACES Configuration

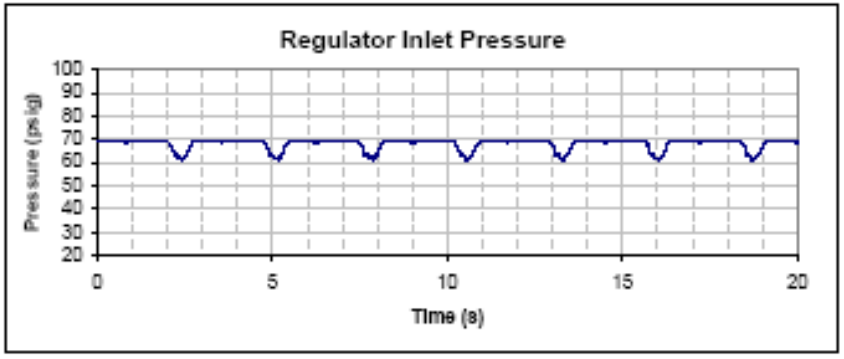
Group:	3 - Varied Mode	Settings				Altitude	GL
Test #:	22	Breathing Rate (bpm)	22	Minute Volume (l)	20	Inlet Pressure (psig)	70
		Stroke Volume (l)	0.91	Peak Inspired Flow (lpm)	120	Regulator Mode	100%

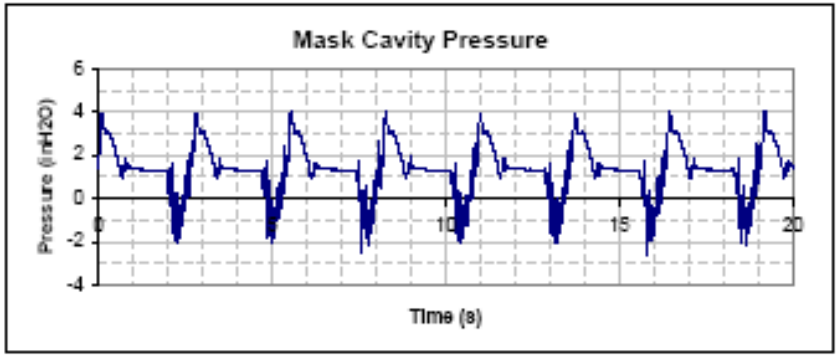






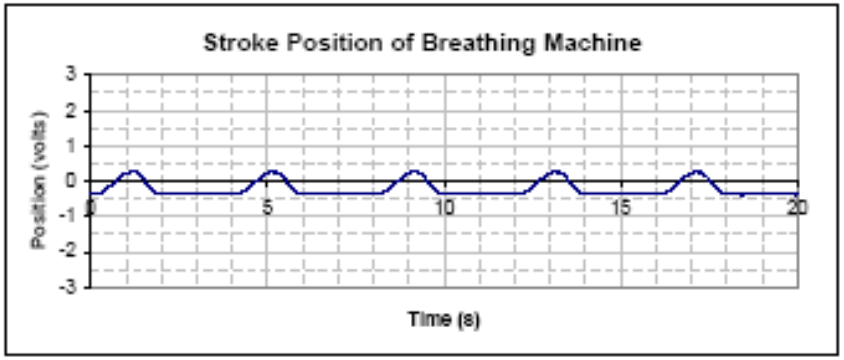


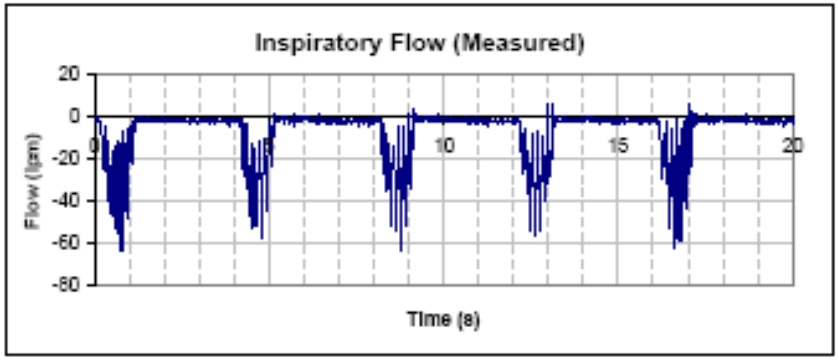


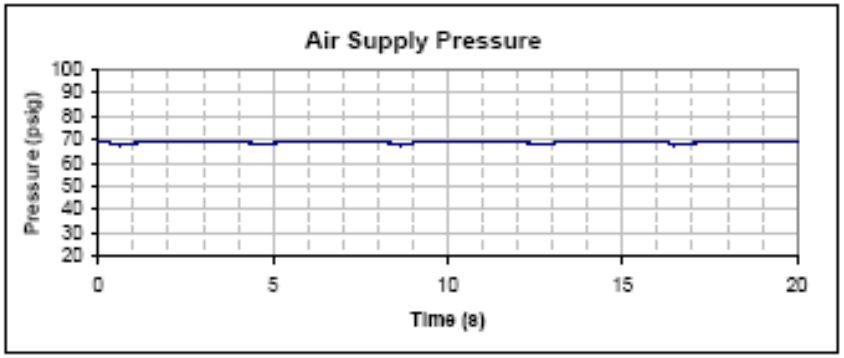


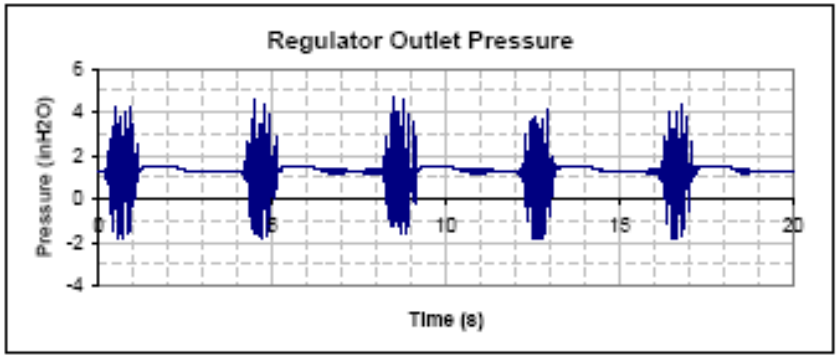
CF188 Oxygen System Compatability Test - NACES Configuration

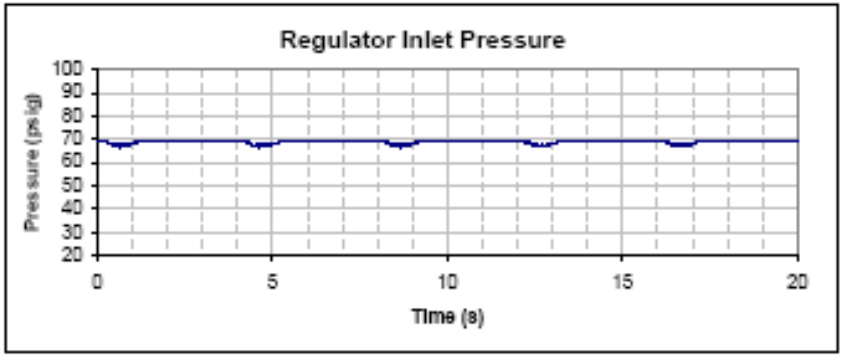
Group:	3 - Varied Mode	Settings				Altitude	GL
Test #:	23	Breathing Rate (bpm)	15	Minute Volume (l)	5	Inlet Pressure (psig)	70
		Stroke Volume (l)	0.33	Peak Inspired Flow (lpm)	30	Regulator Mode	100%

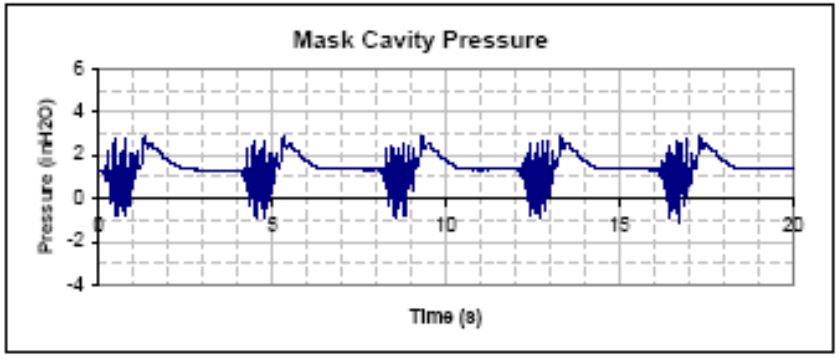






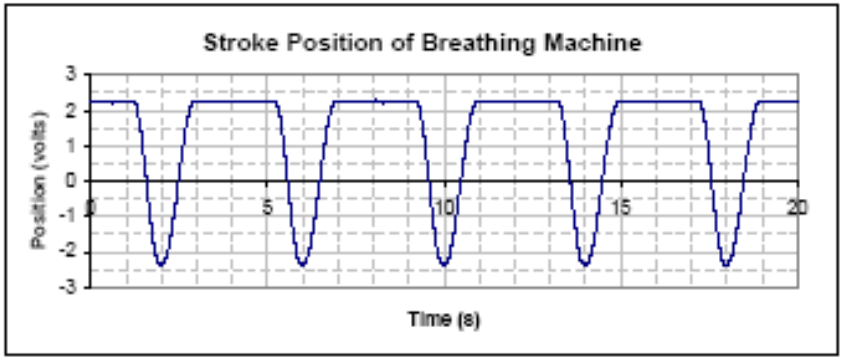


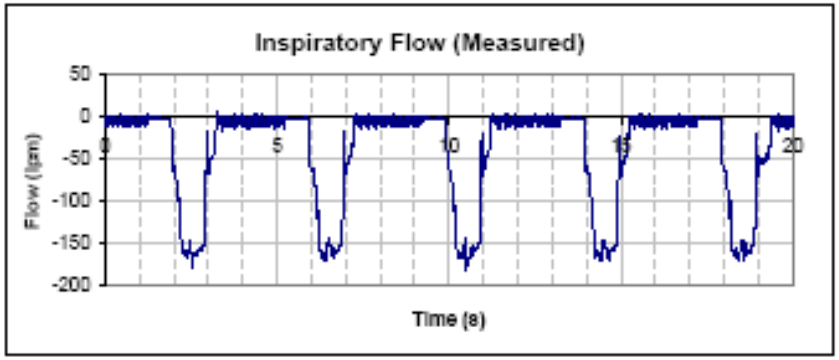


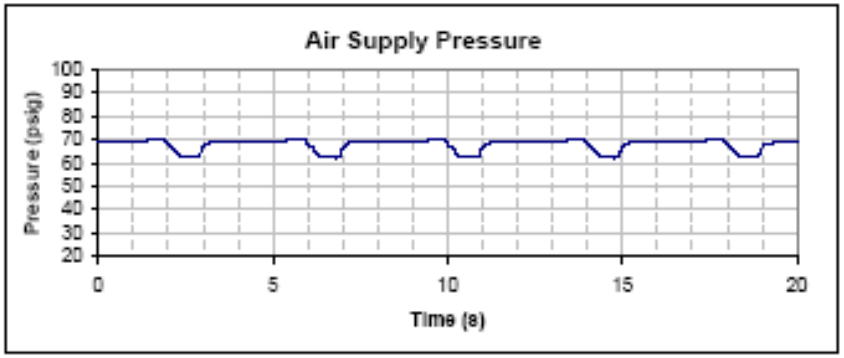


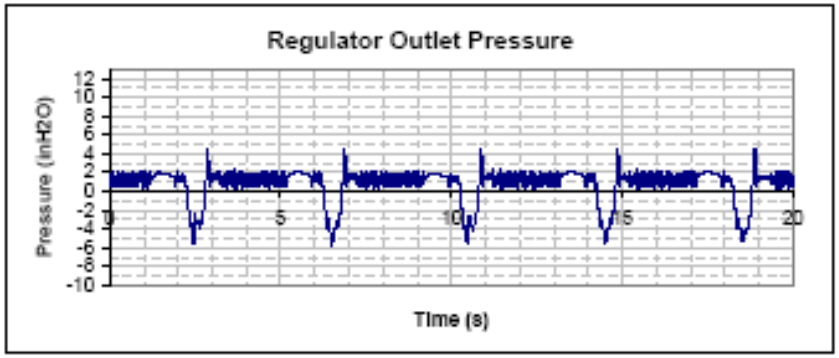
CF188 Oxygen System Compatability Test - NACES Configuration

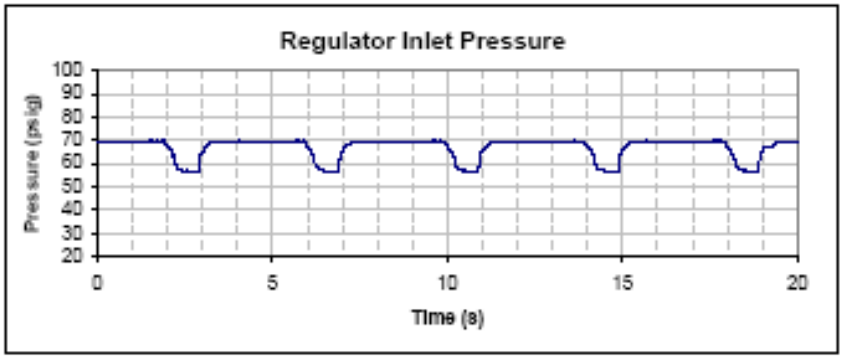
Group: 3 - Varied Mode	Settings			Altitude	GL
Test #: 24	Breathing Rate (bpm)	15	Minute Volume (l) 37.5	Inlet Pressure (psig)	70
	Stroke Volume (l)	2.5	Peak Inspired Flow (lpm) 250	Regulator Mode	100%

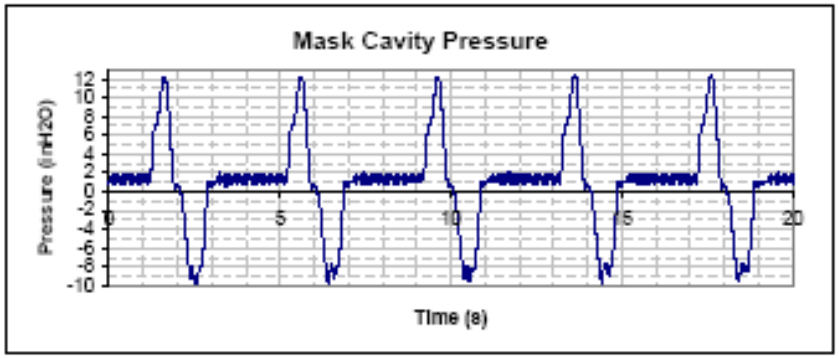






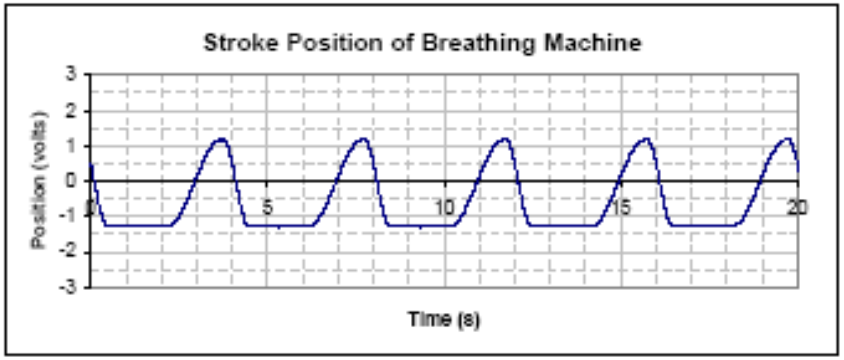


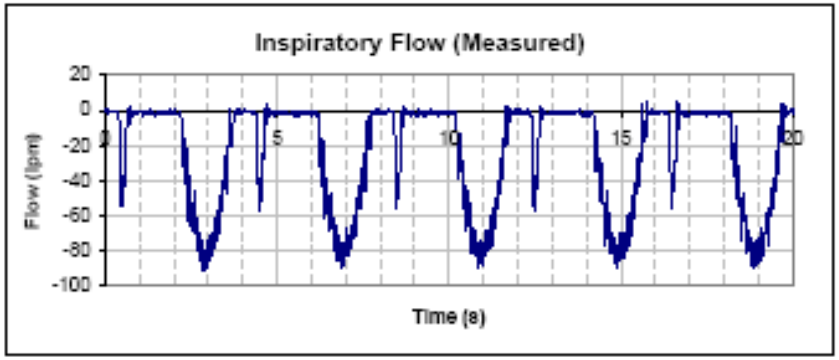


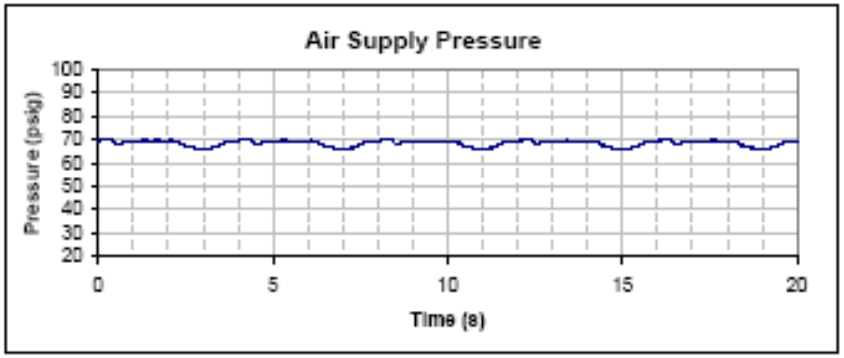


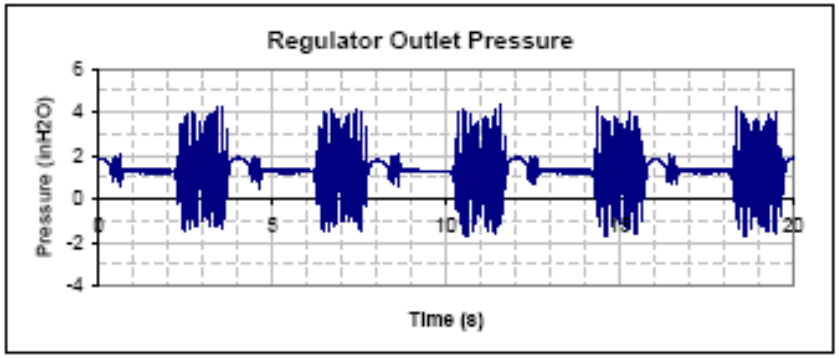
CF188 Oxygen System Compatability Test - NACES Configuration

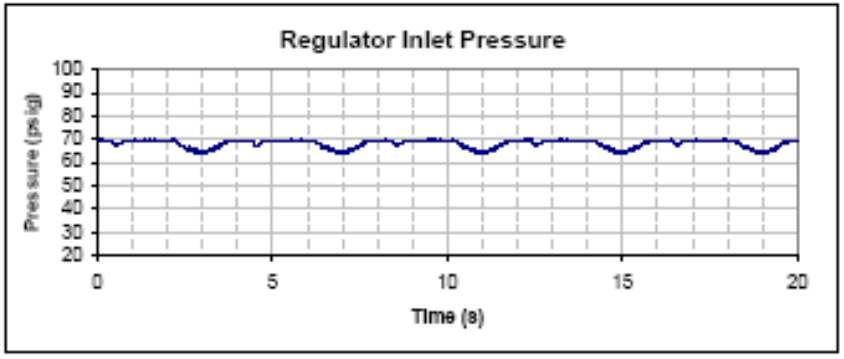
Group:	3 - Varied Mode	Settings				Altitude	GL
Test #:	25	Breathing Rate (bpm)	15	Minute Volume (l)	20	Inlet Pressure (psig)	70
		Stroke Volume (l)	1.33	Peak Inspired Flow (lpm)	80	Regulator Mode	100%

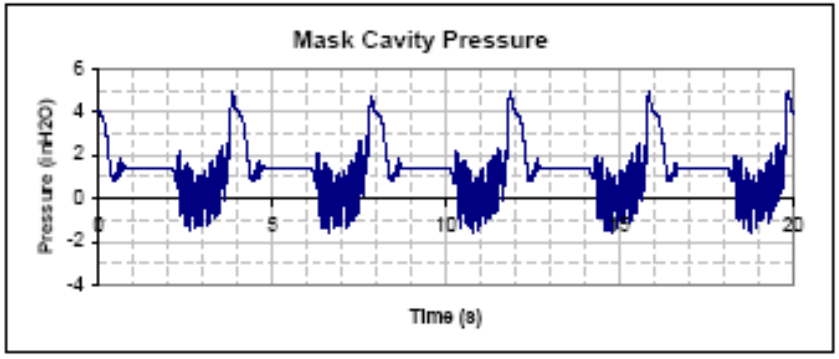






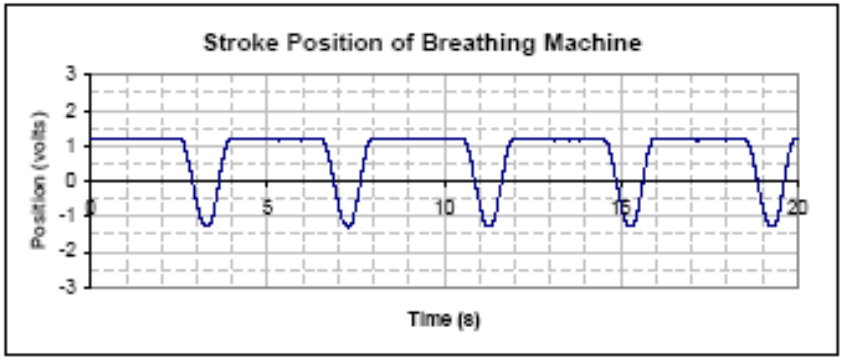


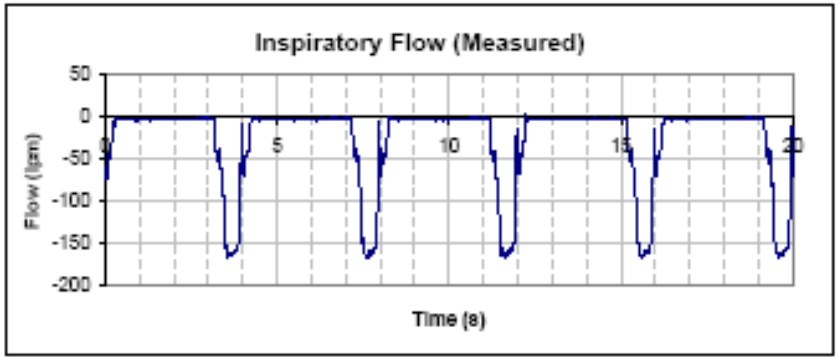


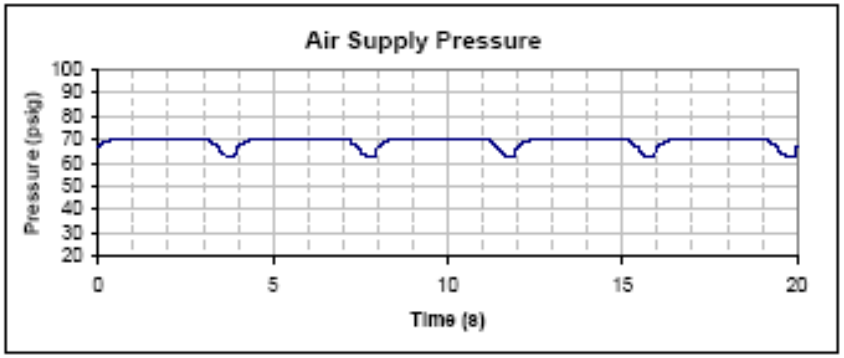


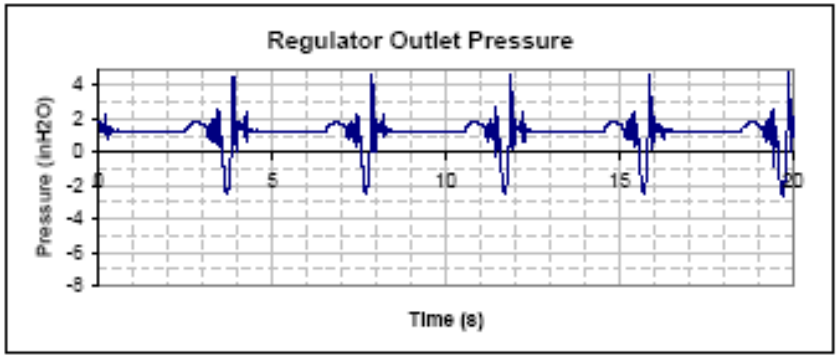
CF188 Oxygen System Compatability Test - NACES Configuration

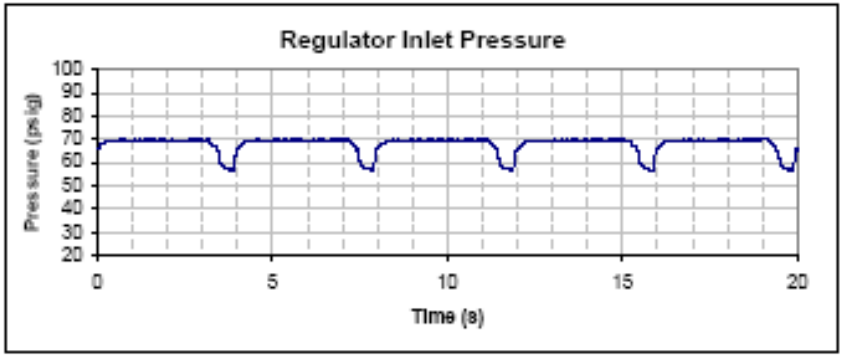
Group: 3 - Varied Mode	Settings			Altitude	GL
Test #: 26	Breathing Rate (bpm)	15	Minute Volume (l) 20	Inlet Pressure (psig)	70
	Stroke Volume (l)	1.33	Peak Inspired Flow (lpm) 200	Regulator Mode	100%

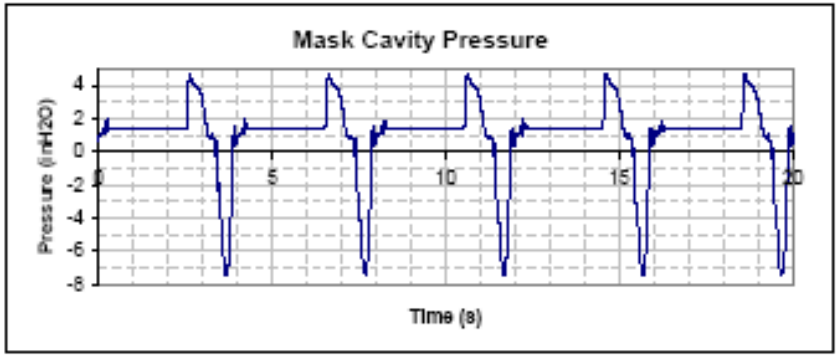






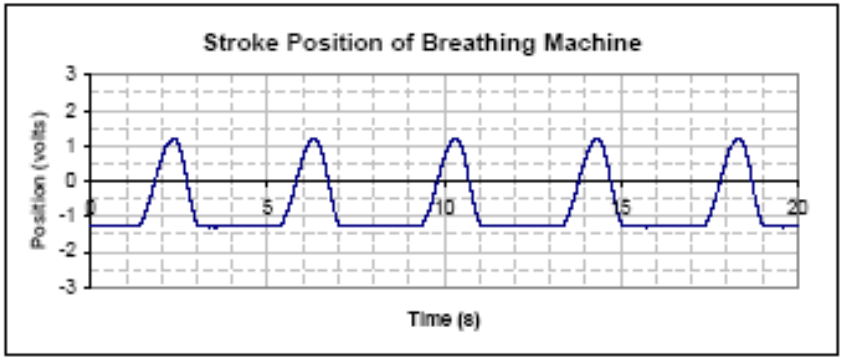


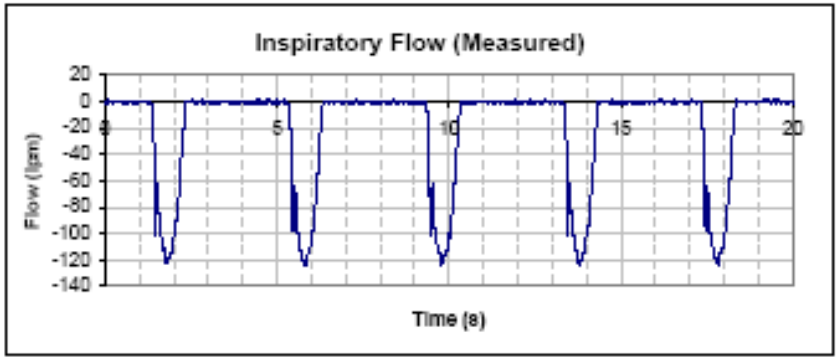


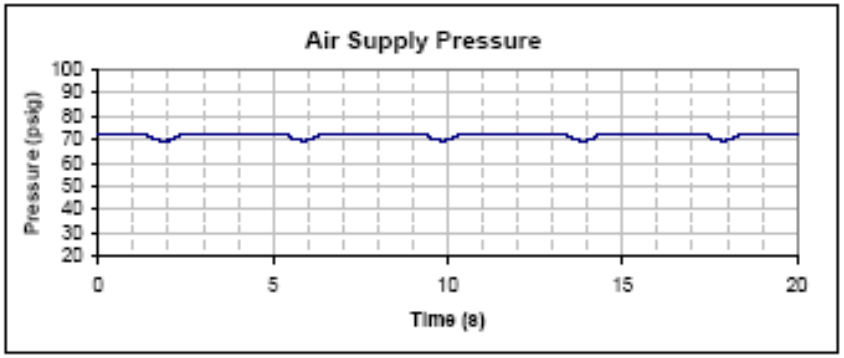


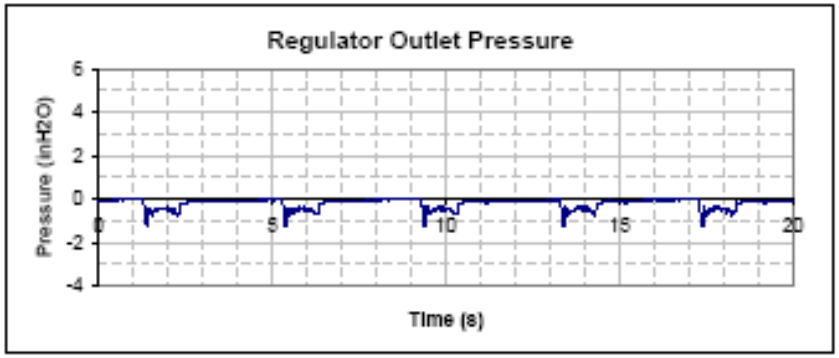
CF188 Oxygen System Compatability Test - NACES Configuration

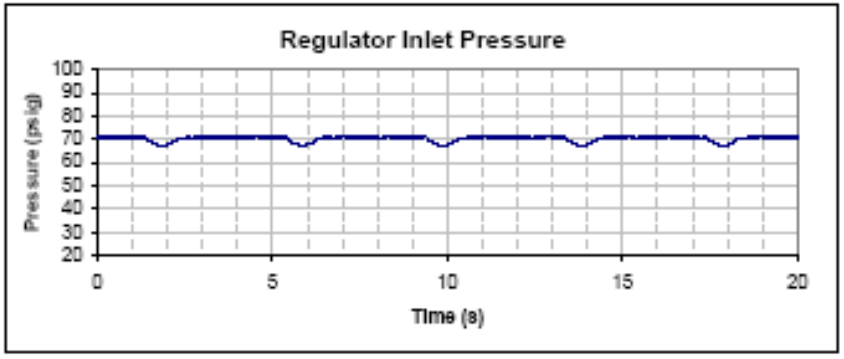
Group:	4 - Varied Altitude	Settings				Altitude	7.5
Test #:	27	Breathing Rate (bpm)	15	Minute Volume (l)	20	Inlet Pressure (psig)	70
		Stroke Volume (l)	1.33	Peak Inspired Flow (lpm)	120	Regulator Mode	Dilution

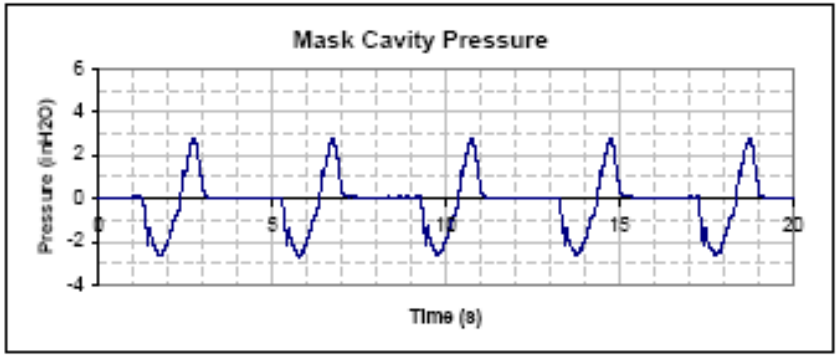






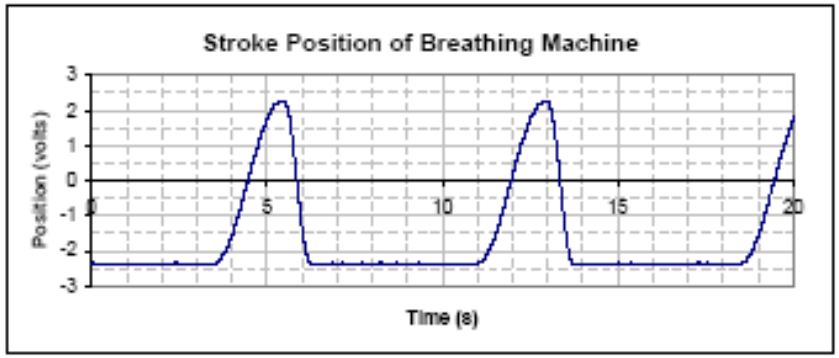


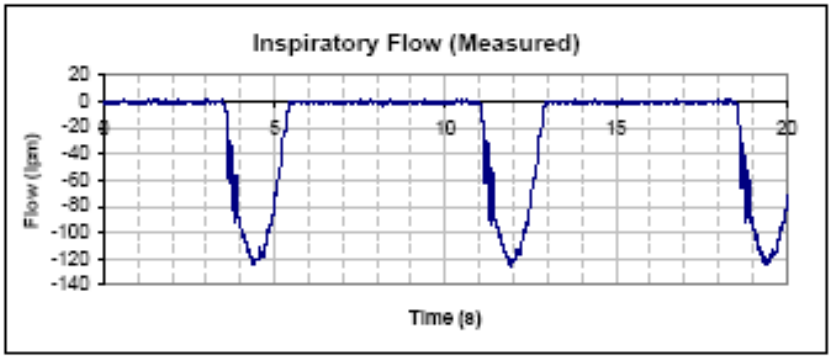


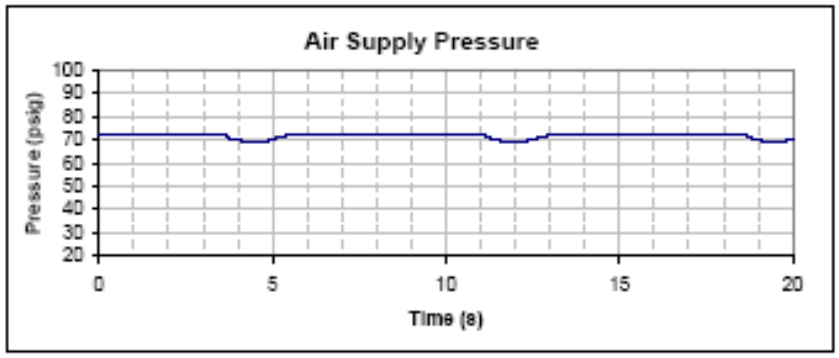


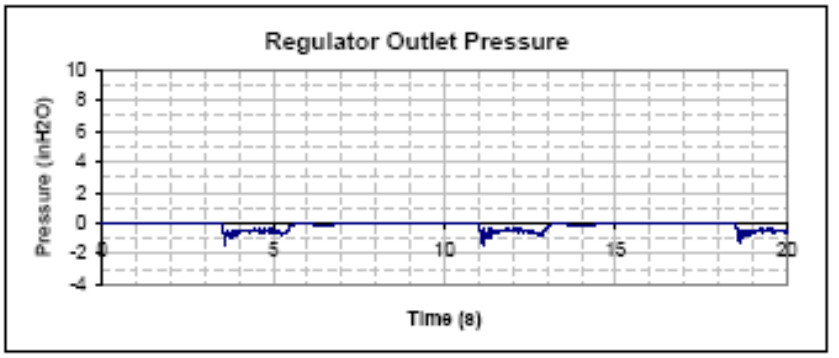
CF188 Oxygen System Compatability Test - NACES Configuration

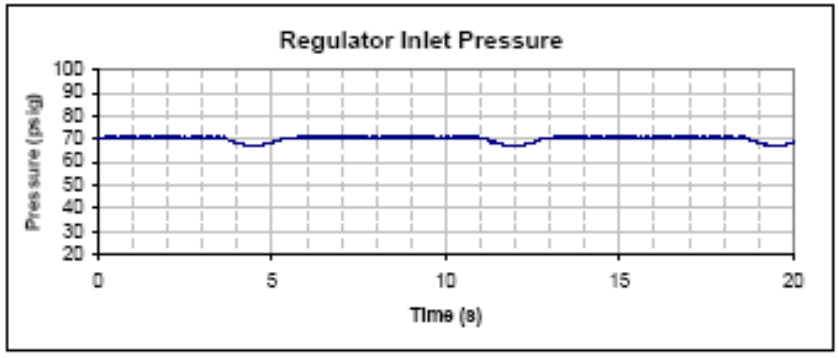
Group:	4 - Varied Altitude	Settings				Altitude	7.5
Test #:	28	Breathing Rate (bpm)	8	Minute Volume (l)	20	Inlet Pressure (psig)	70
		Stroke Volume (l)	2.5	Peak Inspired Flow (lpm)	120	Regulator Mode	Dilution

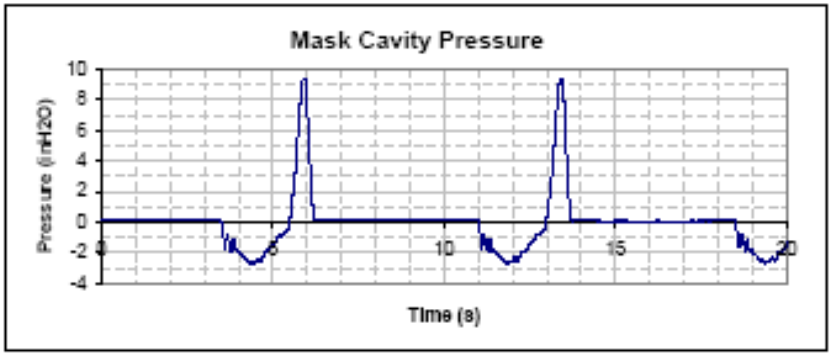






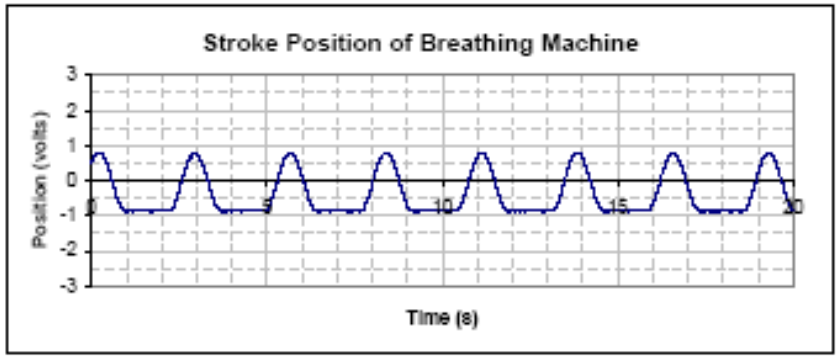


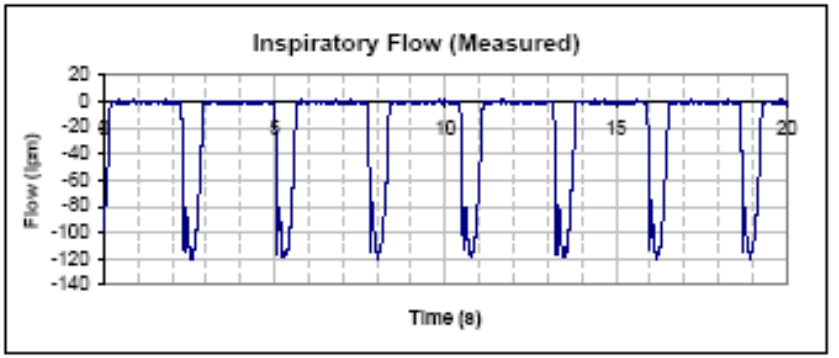


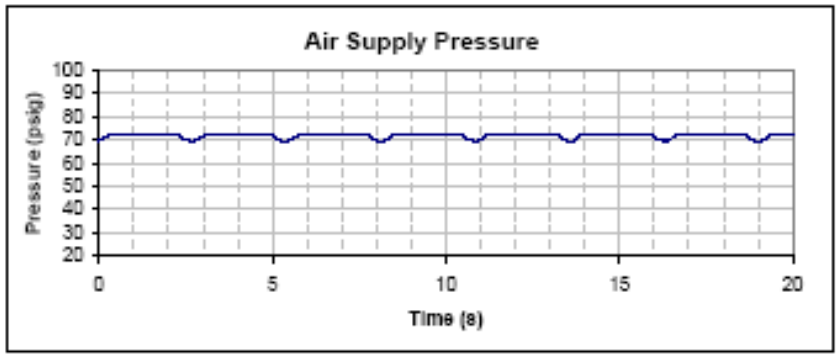


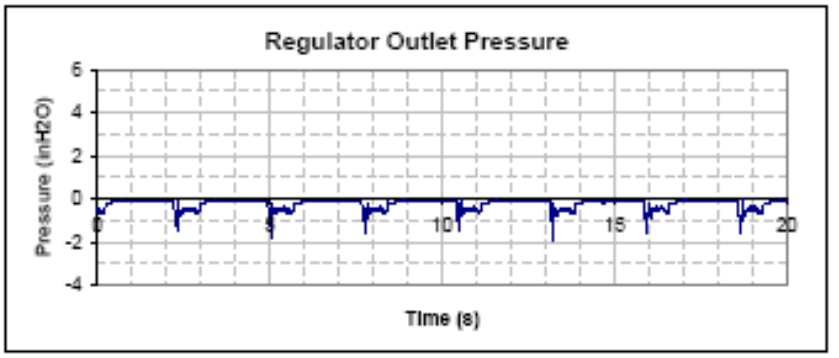
CF188 Oxygen System Compatability Test - NACES Configuration

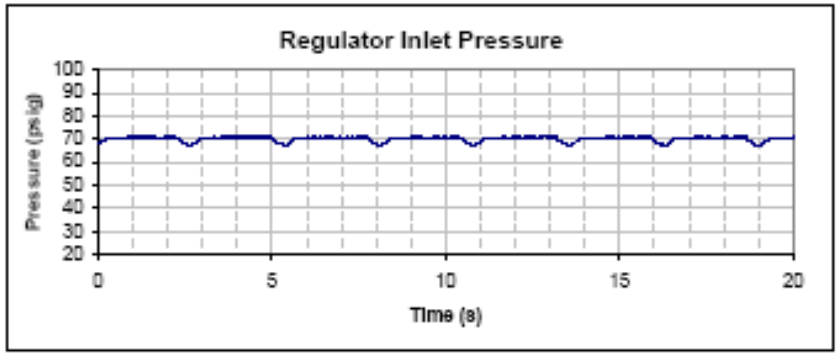
Group:	4 - Varied Altitude	Settings				Altitude	7.5
Test #:	29	Breathing Rate (bpm)	22	Minute Volume (l)	20	Inlet Pressure (psig)	70
		Stroke Volume (l)	0.91	Peak Inspired Flow (lpm)	120	Regulator Mode	Dilution

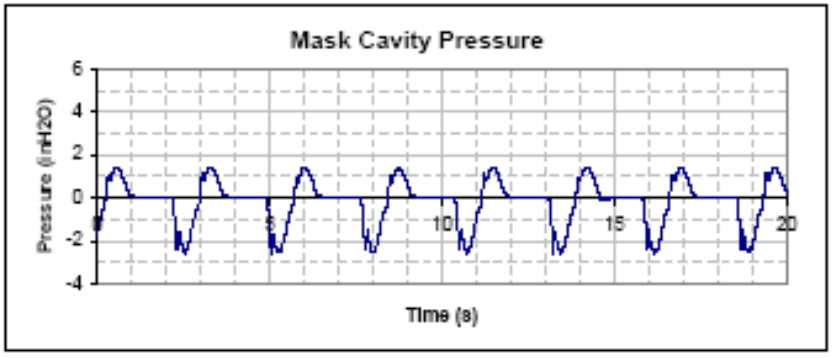






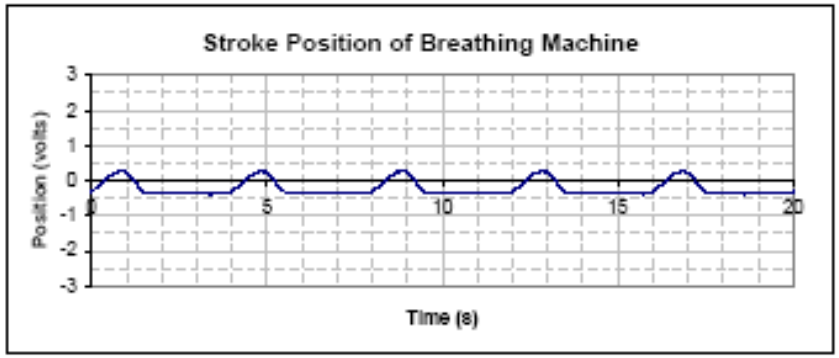


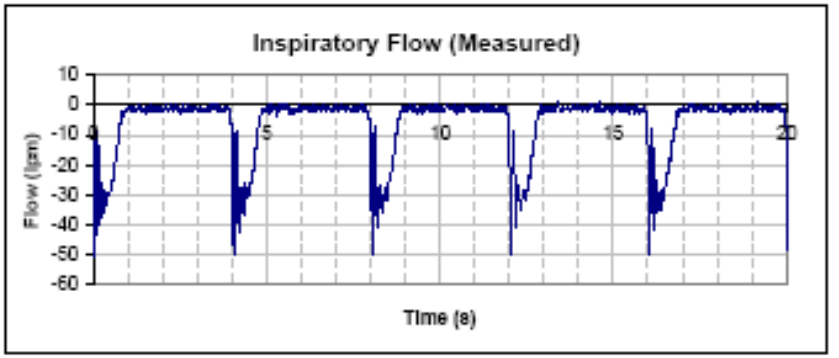


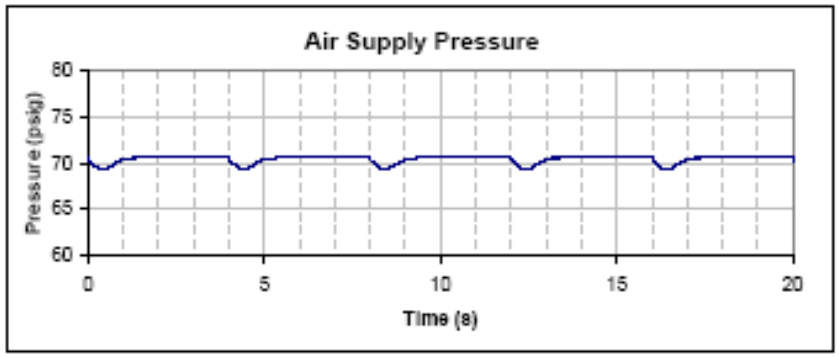


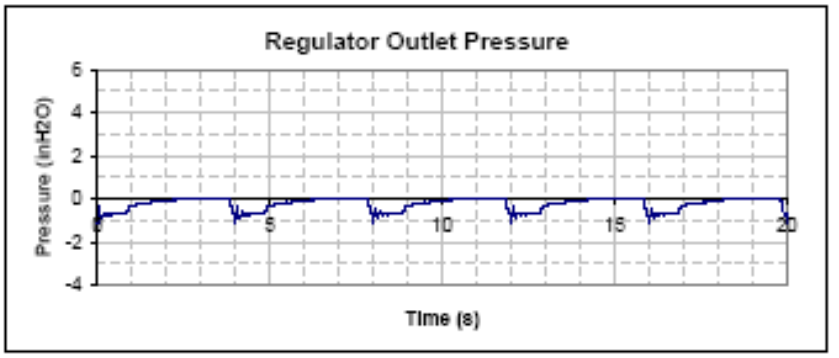
CF188 Oxygen System Compatability Test - NACES Configuration

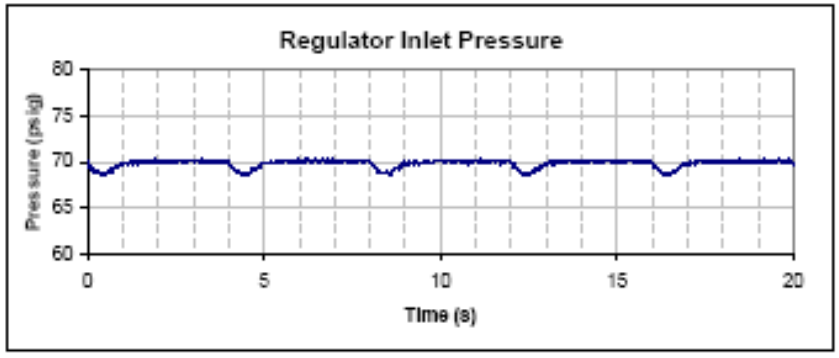
Group:	4 - Varied Altitude	Settings				Altitude	7.5
Test #:	30	Breathing Rate (bpm)	15	Minute Volume (l)	5	Inlet Pressure (psig)	70
		Stroke Volume (l)	0.33	Peak Inspired Flow (lpm)	30	Regulator Mode	Dilution

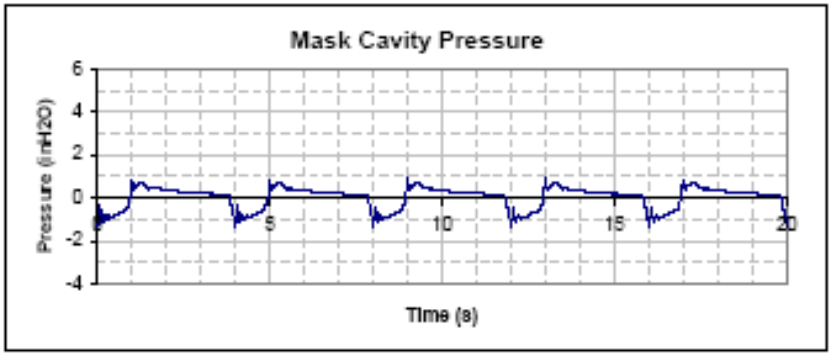






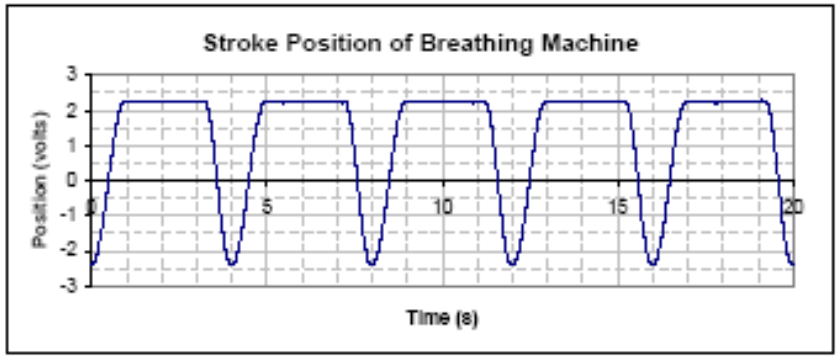


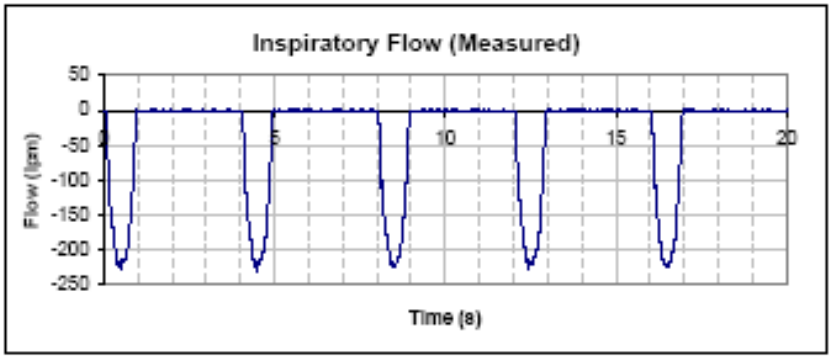


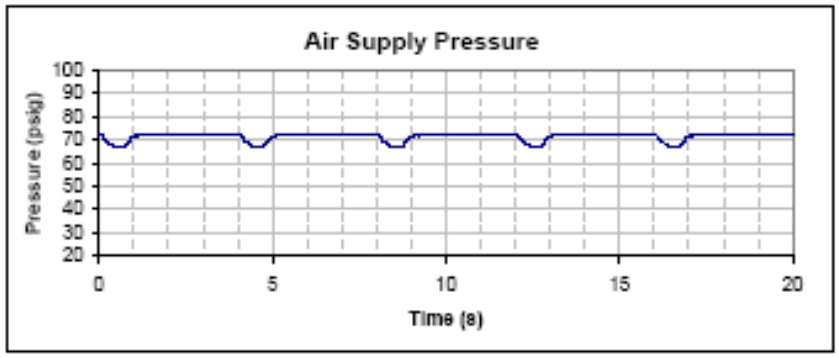


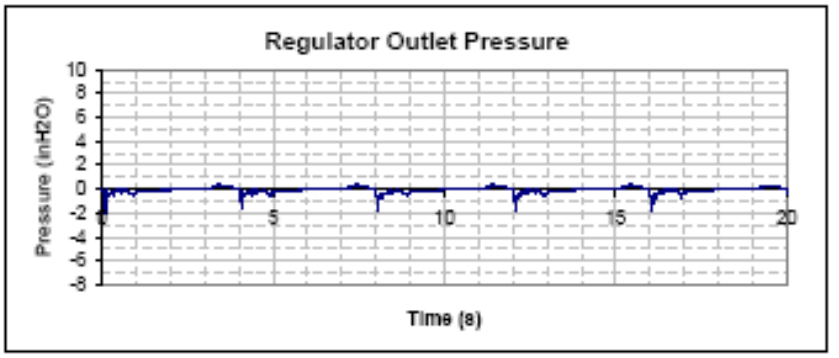
CF188 Oxygen System Compatability Test - NACES Configuration

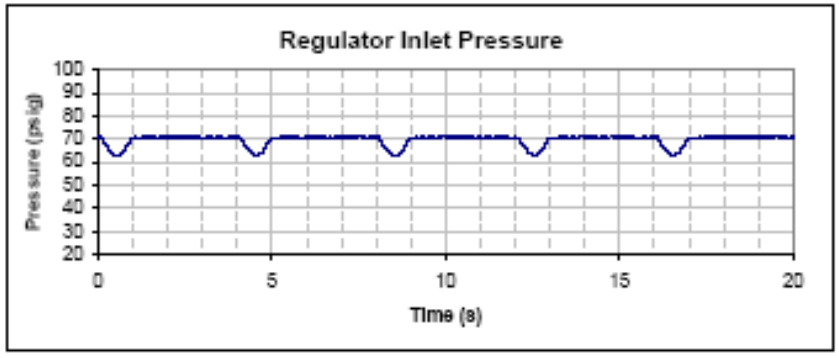
Group:	4 - Varied Altitude	Settings				Altitude	7.5
Test #:	31	Breathing Rate (bpm)	15	Minute Volume (l)	37.5	Inlet Pressure (psig)	70
		Stroke Volume (l)	2.5	Peak Inspired Flow (lpm)	250	Regulator Mode	Dilution

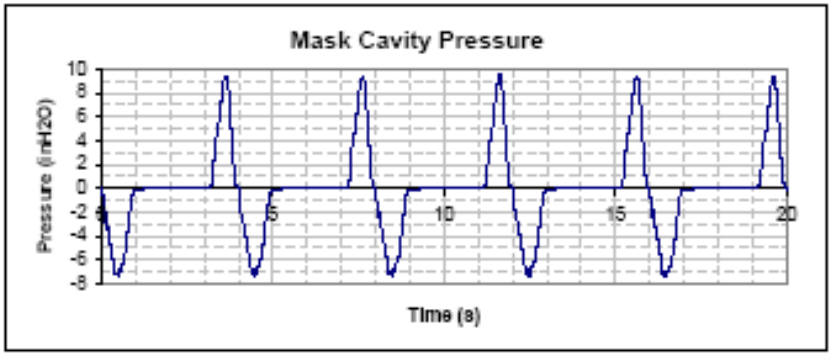






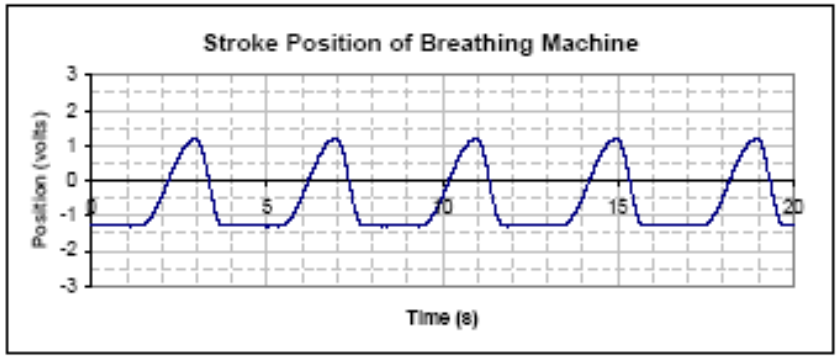


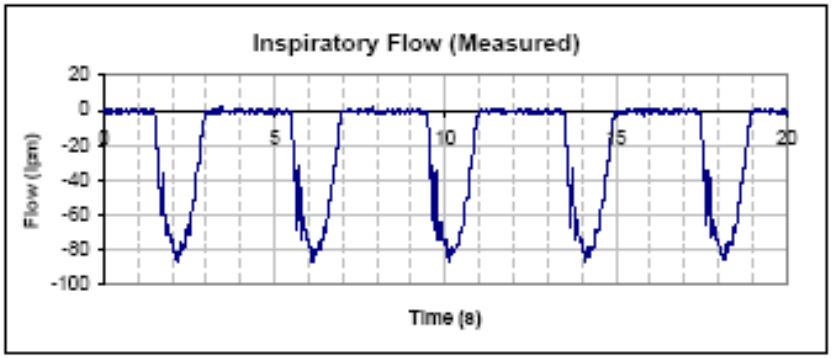


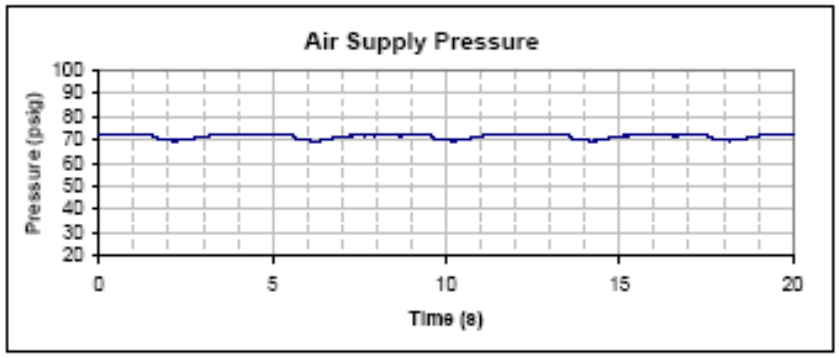


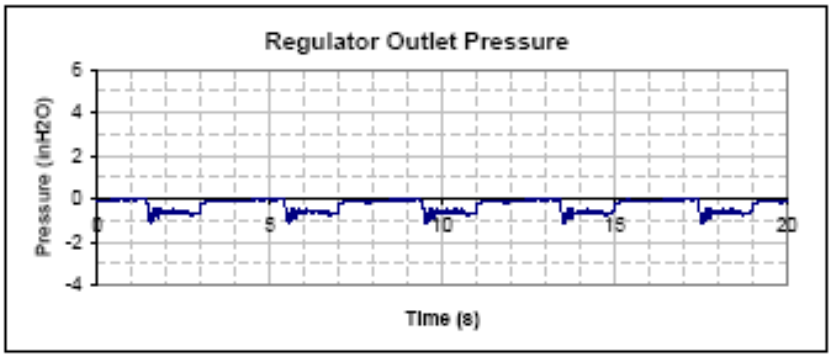
CF188 Oxygen System Compatability Test - NACES Configuration

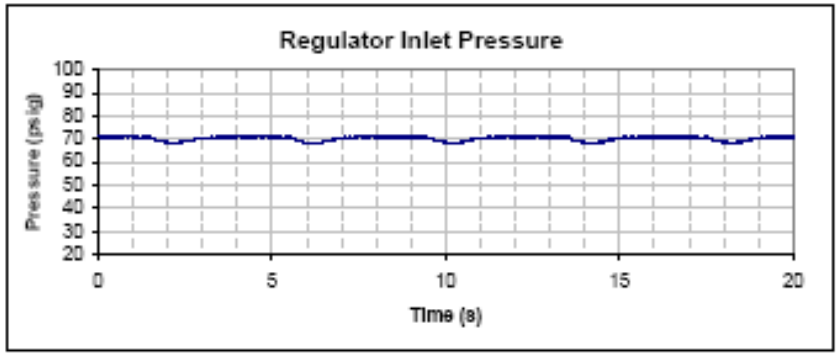
Group:	4 - Varied Altitude	Settings				Altitude	7.5
Test #:	32	Breathing Rate (bpm)	15	Minute Volume (l)	20	Inlet Pressure (psig)	70
		Stroke Volume (l)	1.33	Peak Inspired Flow (lpm)	80	Regulator Mode	Dilution

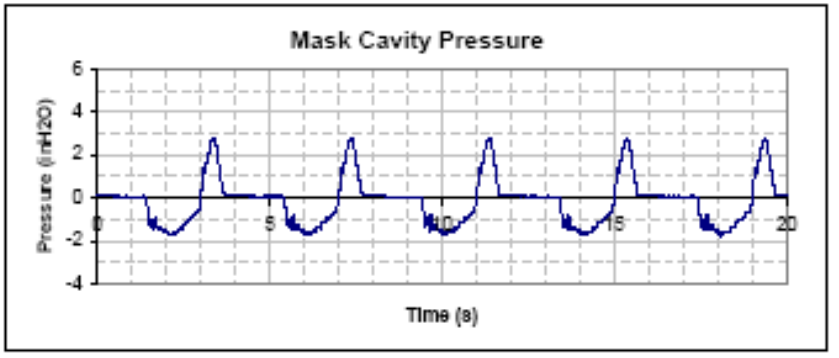






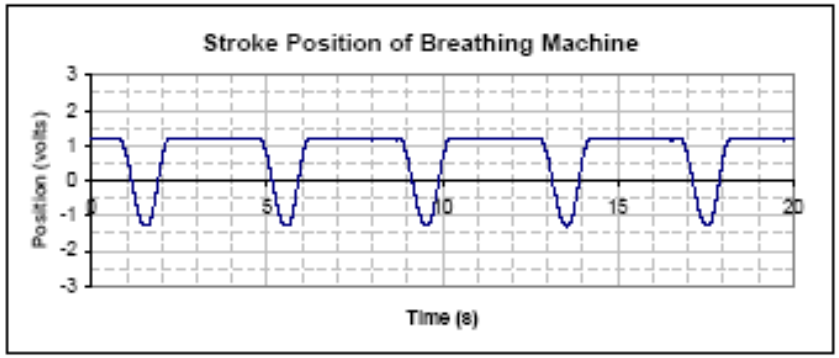


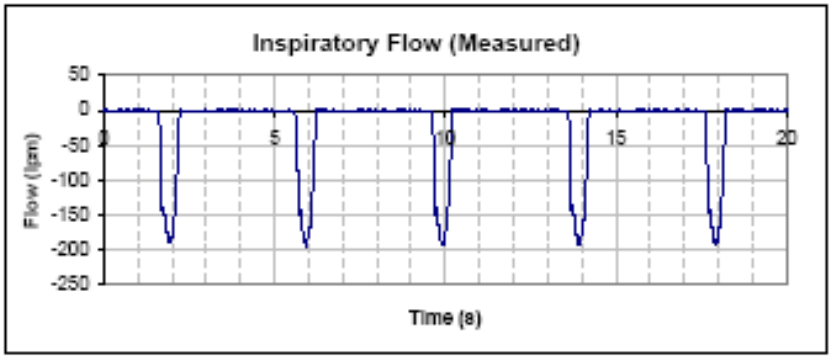


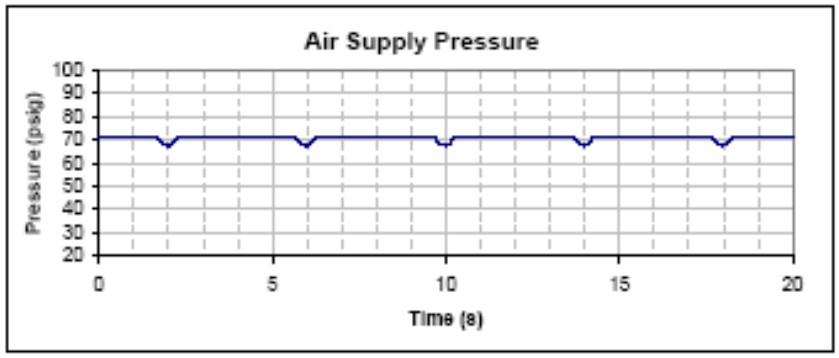


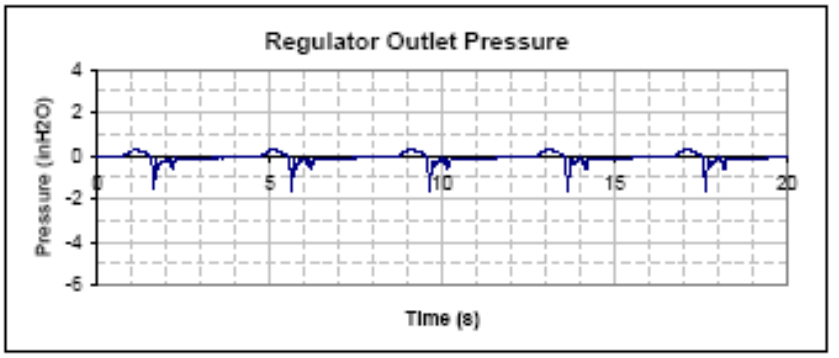
CF188 Oxygen System Compatability Test - NACES Configuration

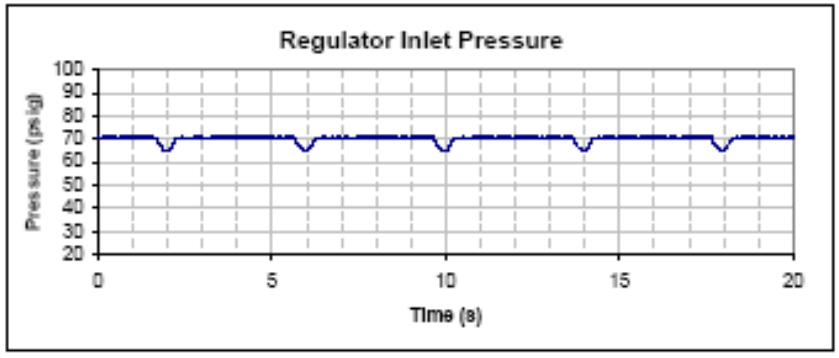
Group:	4 - Varied Altitude	Settings				Altitude	7.5
Test #:	33	Breathing Rate (bpm)	15	Minute Volume (l)	20	Inlet Pressure (psig)	70
		Stroke Volume (l)	1.33	Peak Inspired Flow (lpm)	200	Regulator Mode	Dilution

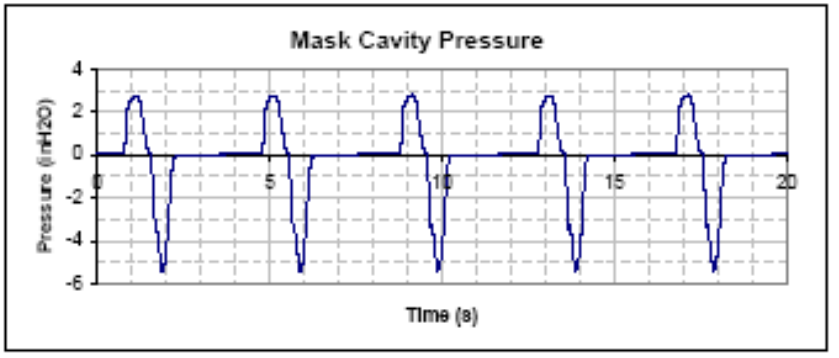






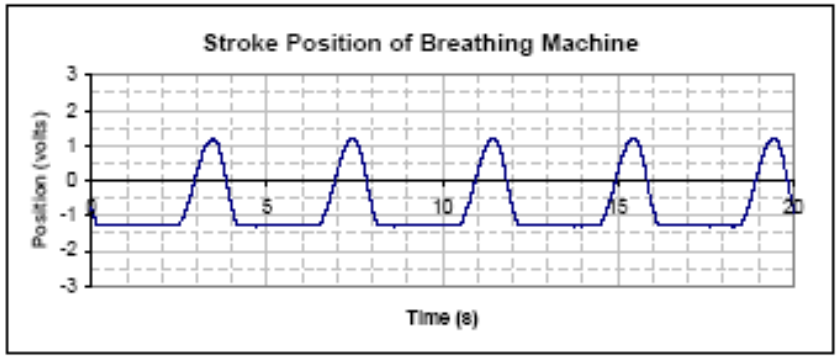


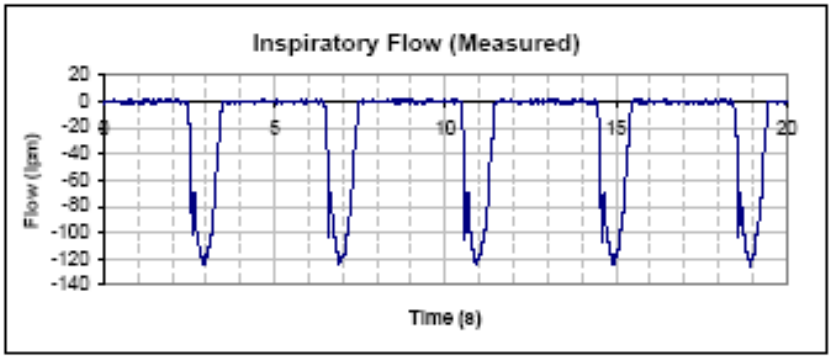


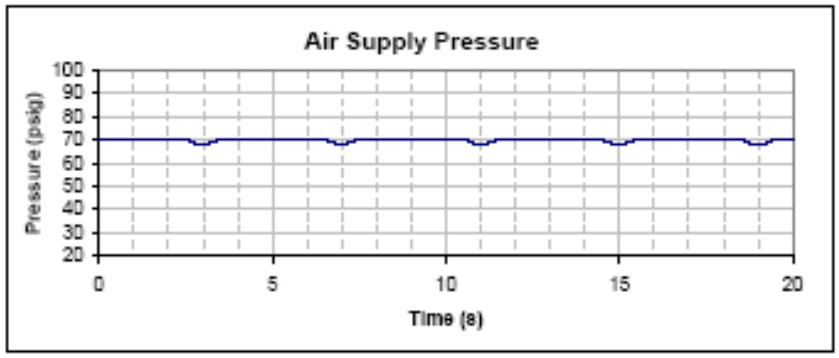


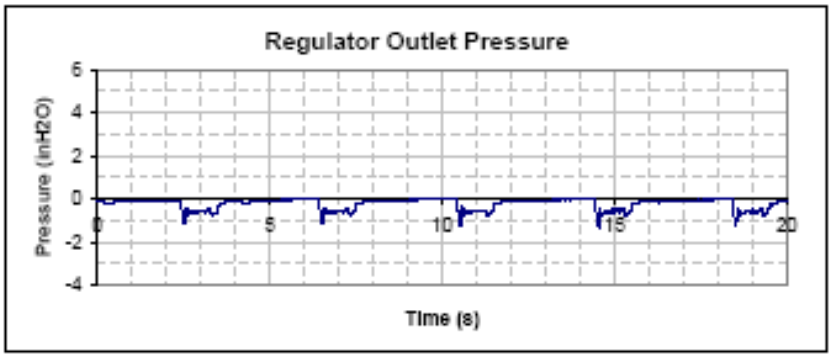
CF188 Oxygen System Compatability Test - NACES Configuration

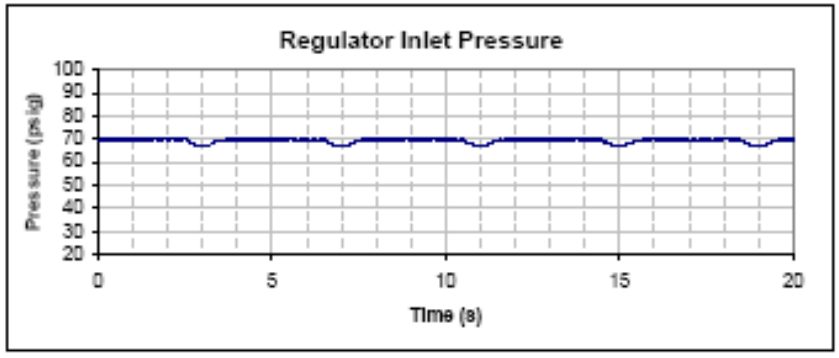
Group:	4 - Varied Altitude	Settings				Altitude	15
Test #:	34	Breathing Rate (bpm)	15	Minute Volume (l)	20	Inlet Pressure (psig)	70
		Stroke Volume (l)	1.33	Peak Inspired Flow (lpm)	120	Regulator Mode	Dilution

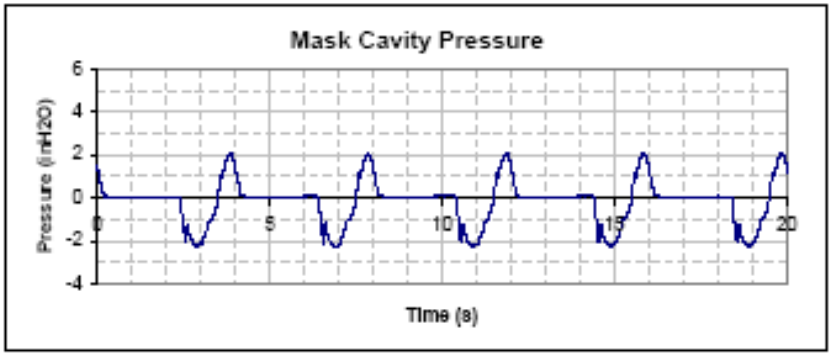






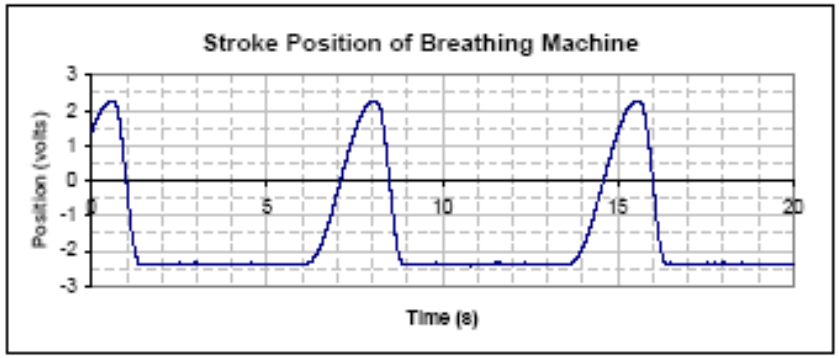


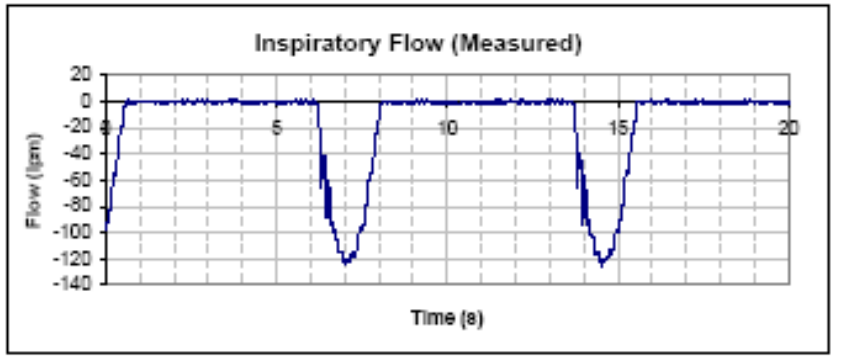


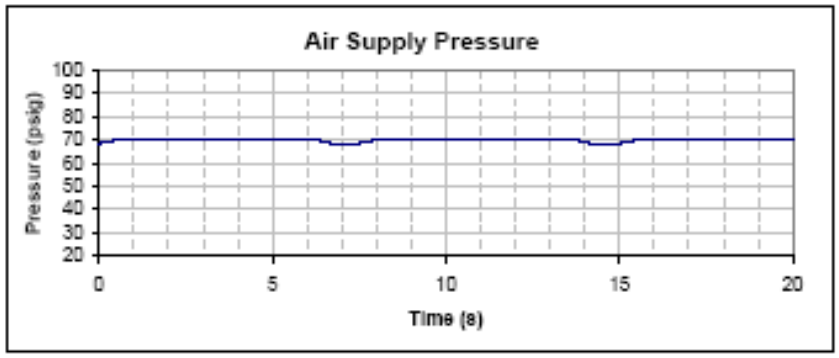


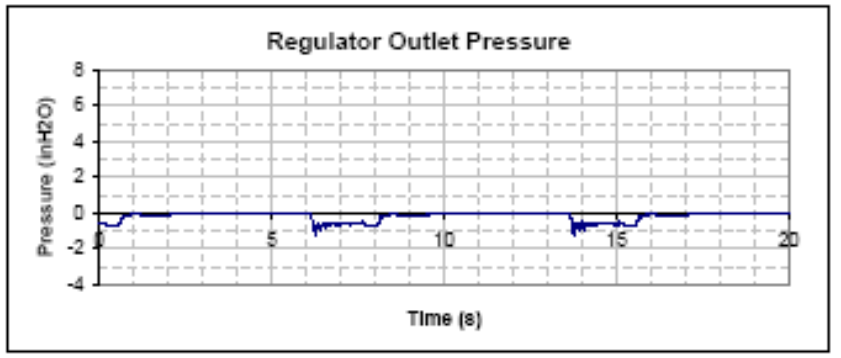
CF188 Oxygen System Compatability Test - NACES Configuration

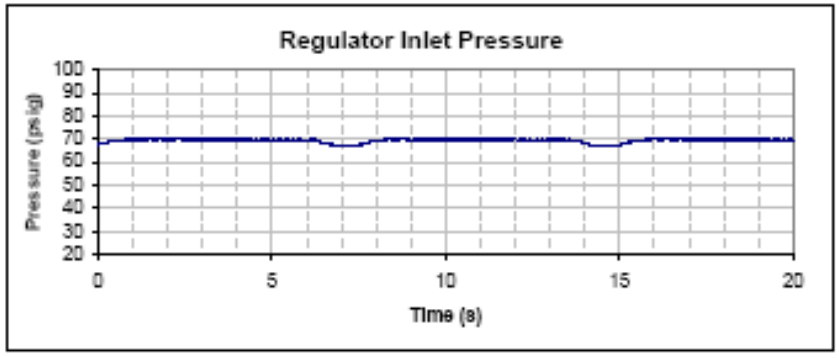
Group:	4 - Varied Altitude	Settings				Altitude	15
Test #:	35	Breathing Rate (bpm)	8	Minute Volume (l)	20	Inlet Pressure (psig)	70
		Stroke Volume (l)	2.5	Peak Inspired Flow (lpm)	120	Regulator Mode	Dilution

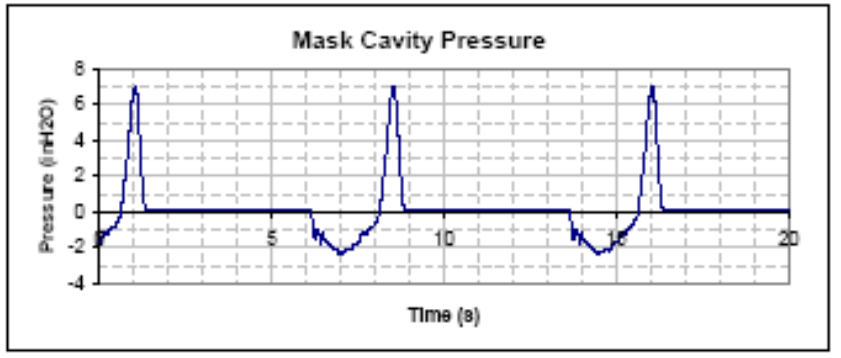






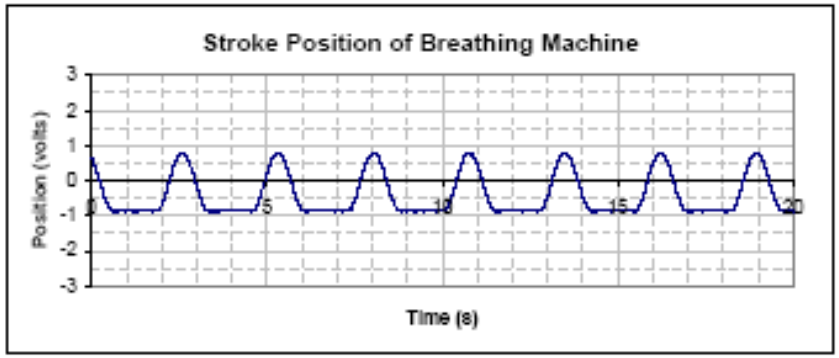


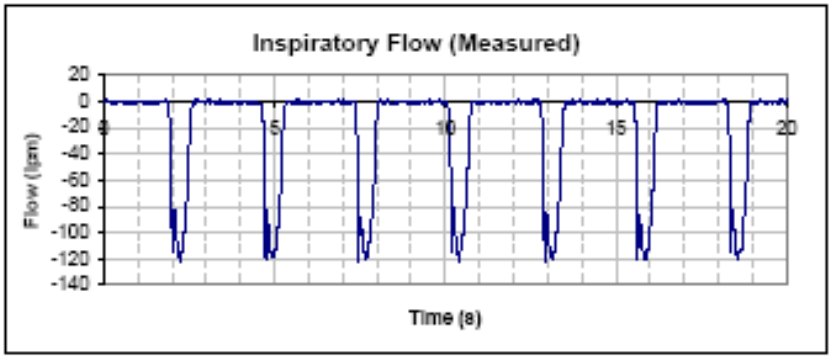


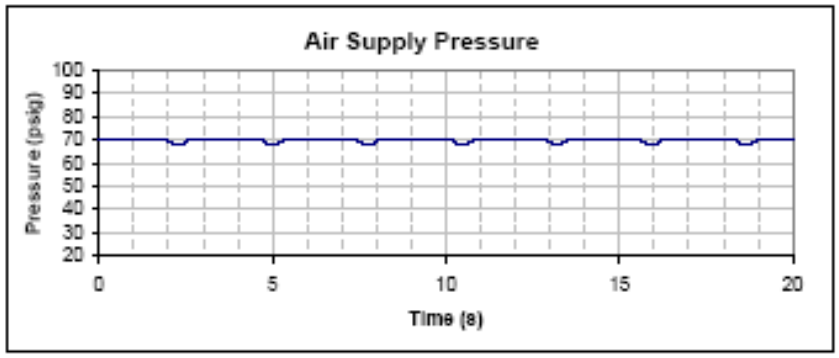


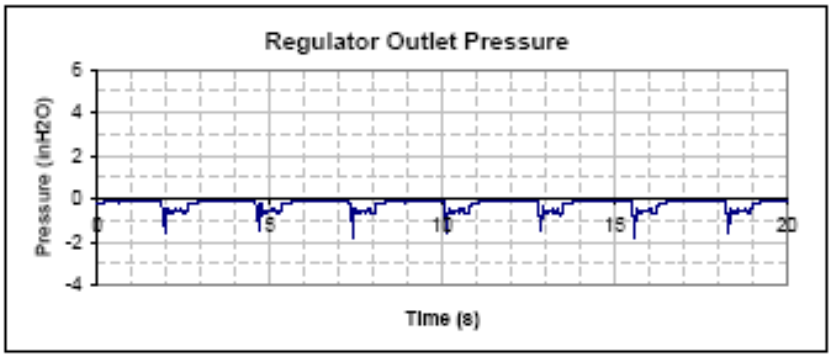
CF188 Oxygen System Compatability Test - NACES Configuration

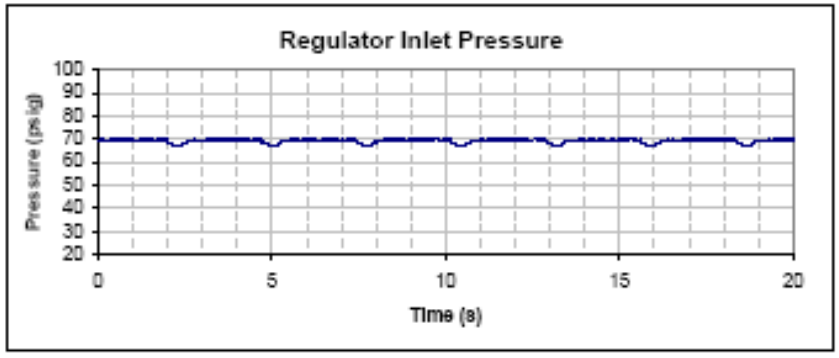
Group:	4 - Varied Altitude	Settings				Altitude	15
Test #:	36	Breathing Rate (bpm)	22	Minute Volume (l)	20	Inlet Pressure (psig)	70
		Stroke Volume (l)	0.91	Peak Inspired Flow (lpm)	120	Regulator Mode	Dilution

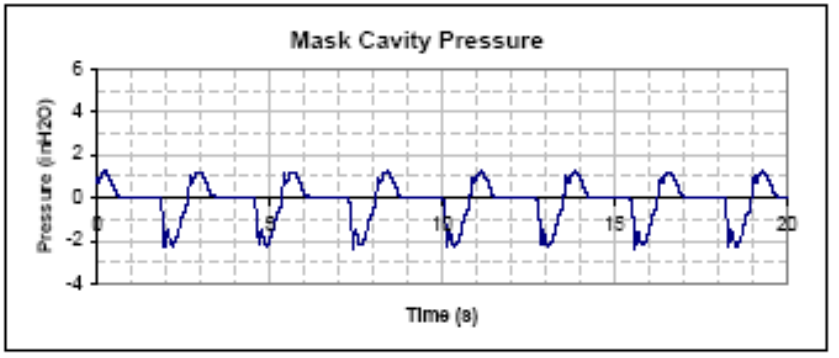






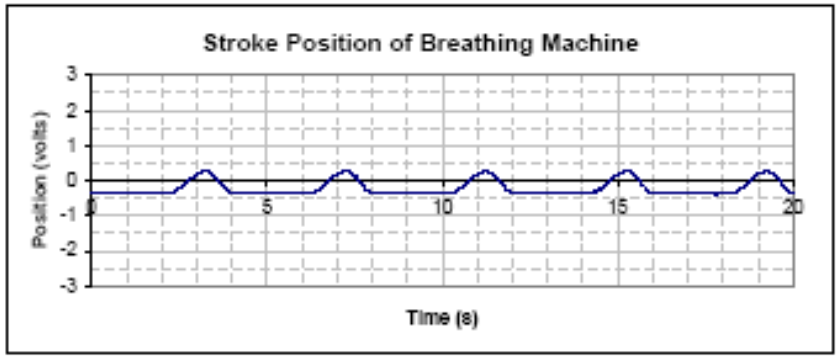


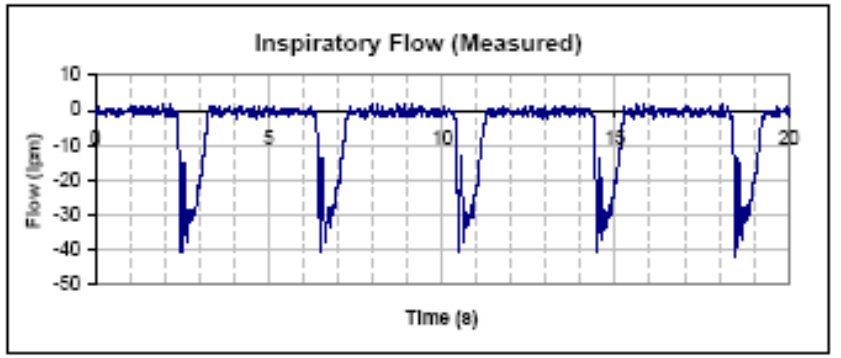


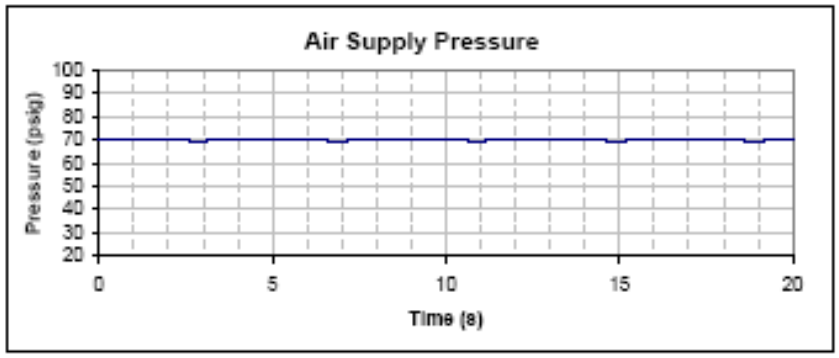


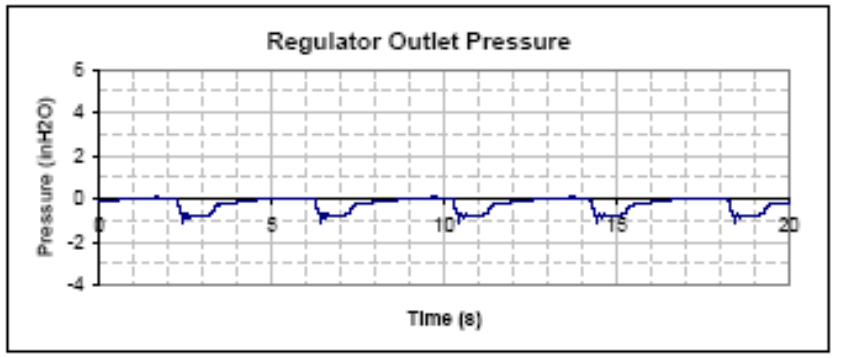
CF188 Oxygen System Compatability Test - NACES Configuration

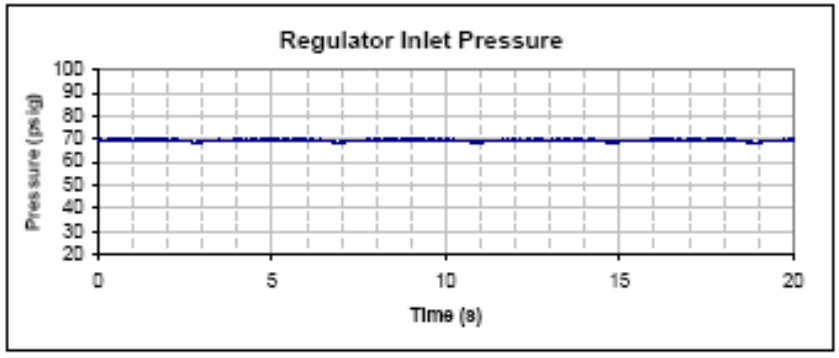
Group:	4 - Varied Altitude	Settings				Altitude	15
Test #:	37	Breathing Rate (bpm)	15	Minute Volume (l)	5	Inlet Pressure (psig)	70
		Stroke Volume (l)	0.33	Peak Inspired Flow (lpm)	30	Regulator Mode	Dilution

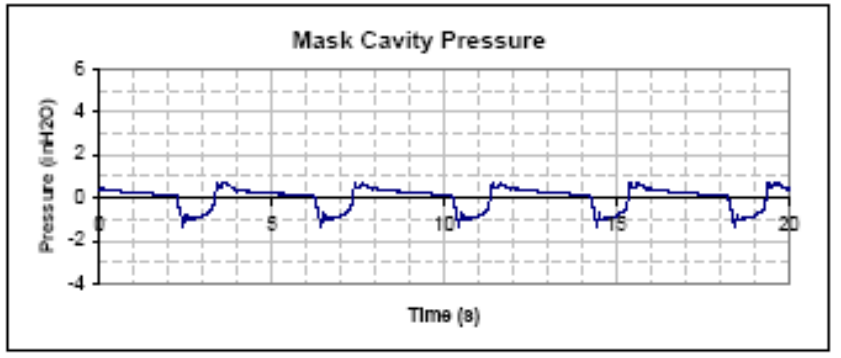






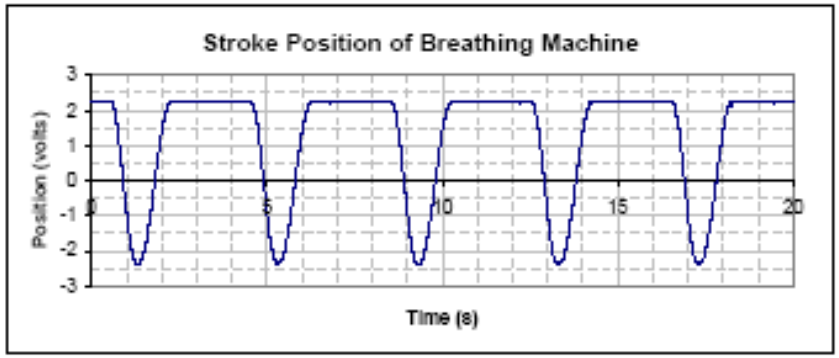


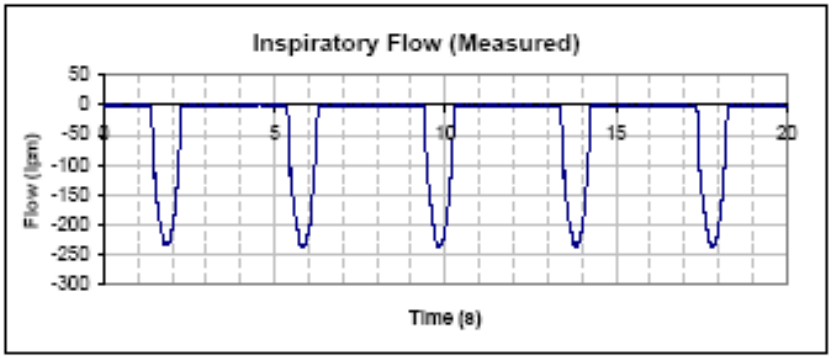


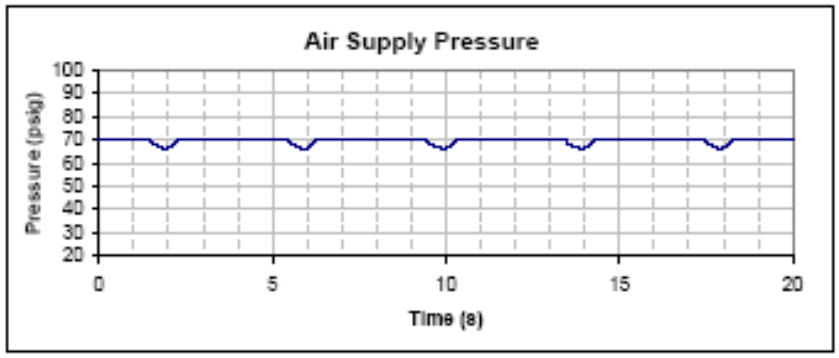


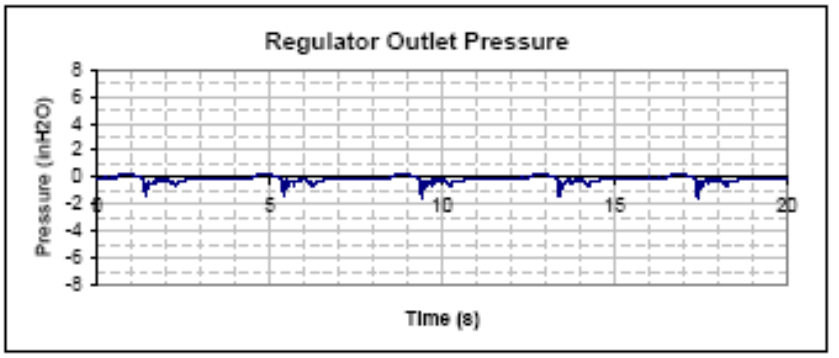
CF188 Oxygen System Compatability Test - NACES Configuration

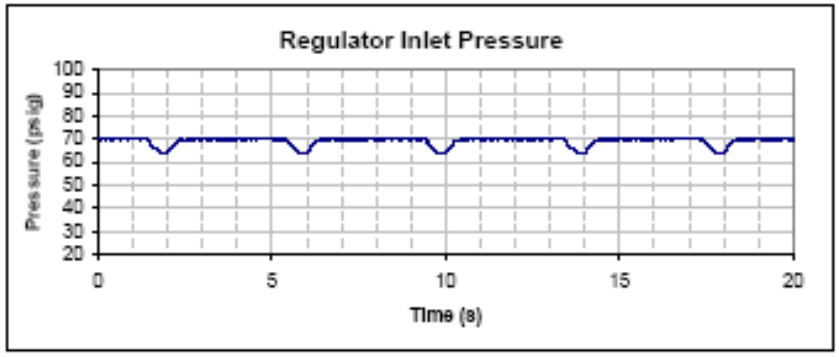
Group:	4 - Varied Altitude	Settings				Altitude	15
Test #:	38	Breathing Rate (bpm)	15	Minute Volume (l)	37.5	Inlet Pressure (psig)	70
		Stroke Volume (l)	2.5	Peak Inspired Flow (lpm)	250	Regulator Mode	Dilution

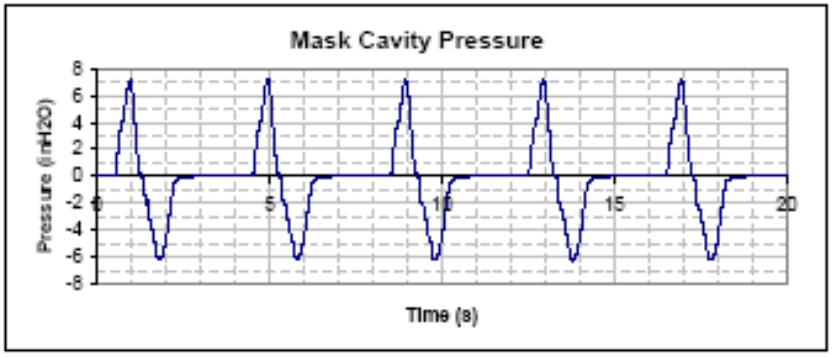






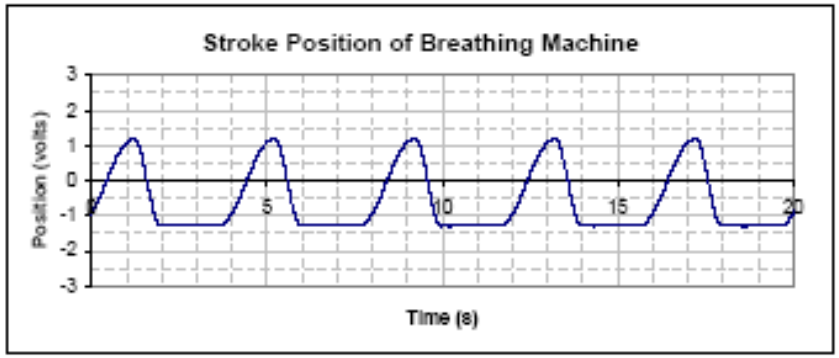


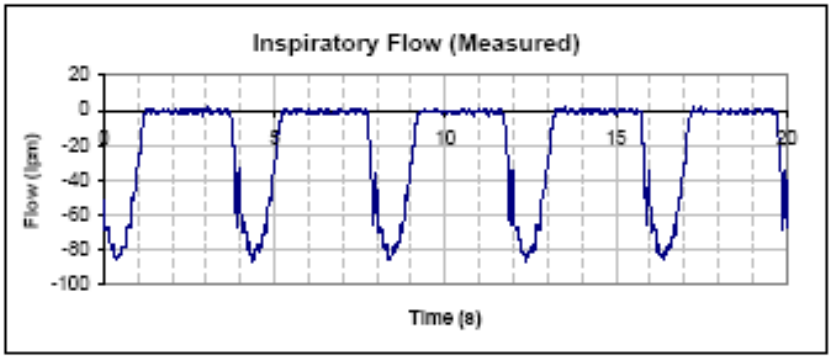


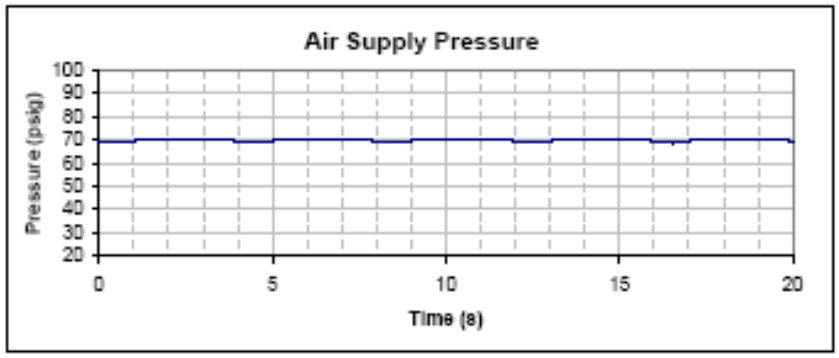


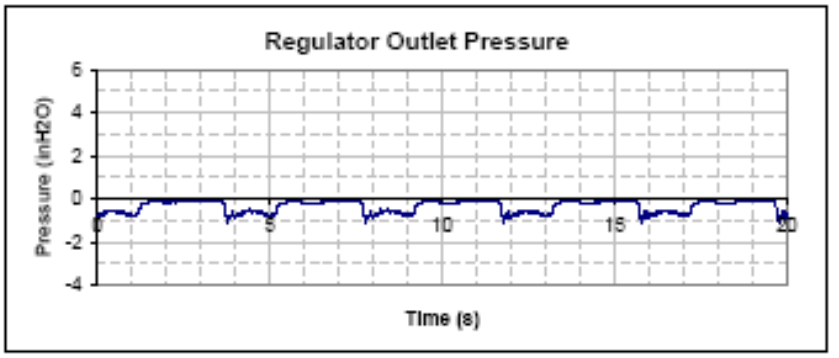
CF188 Oxygen System Compatability Test - NACES Configuration

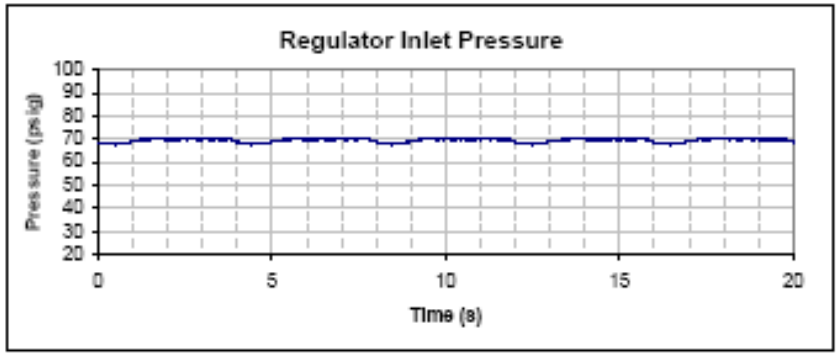
Group:	4 - Varied Altitude	Settings				Altitude	15
Test #:	39	Breathing Rate (bpm)	15	Minute Volume (l)	20	Inlet Pressure (psig)	70
		Stroke Volume (l)	1.33	Peak Inspired Flow (lpm)	80	Regulator Mode	Dilution

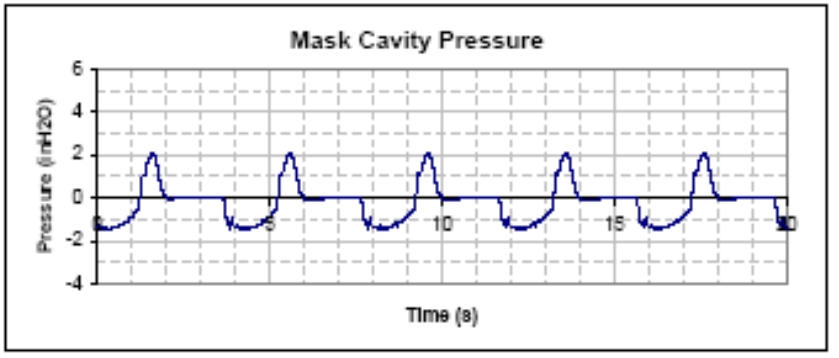










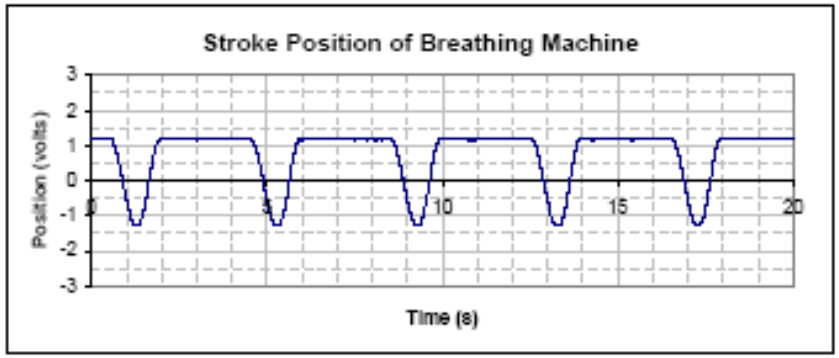


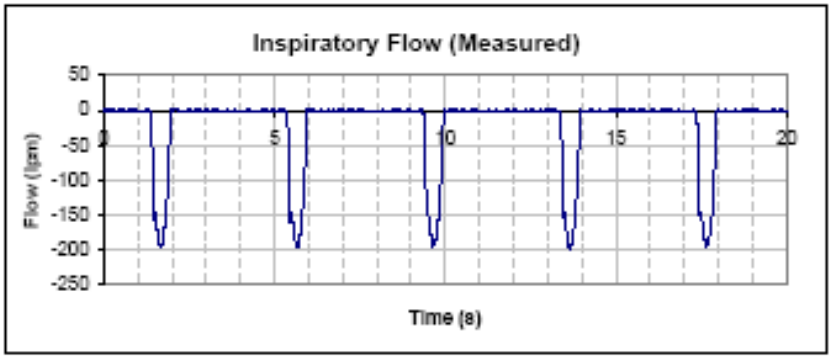
CF188 Oxygen System Compatability Test - NACES Configuration

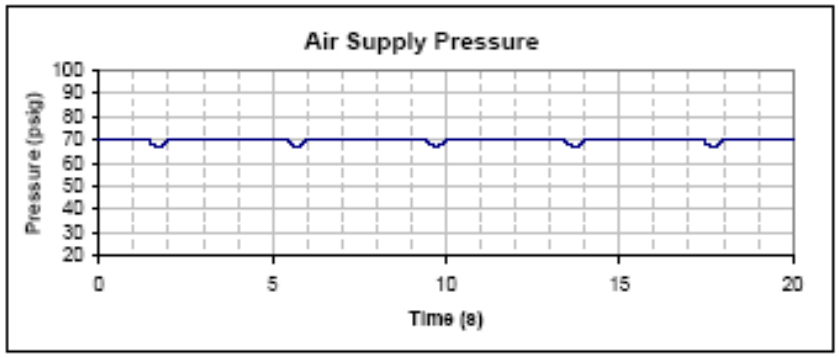
Group: 4 - Varied Altitude
Test #: 40

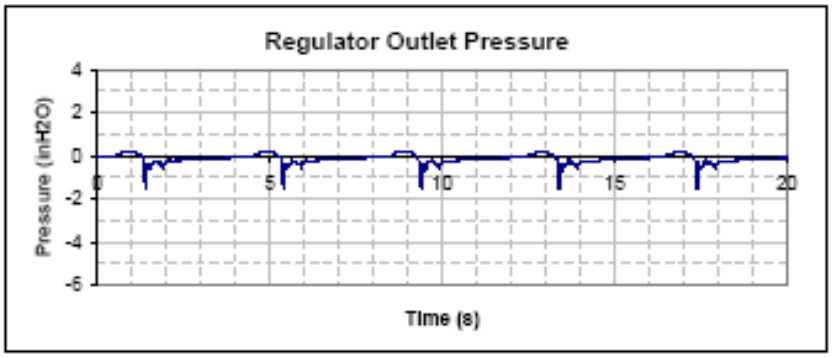
Settings

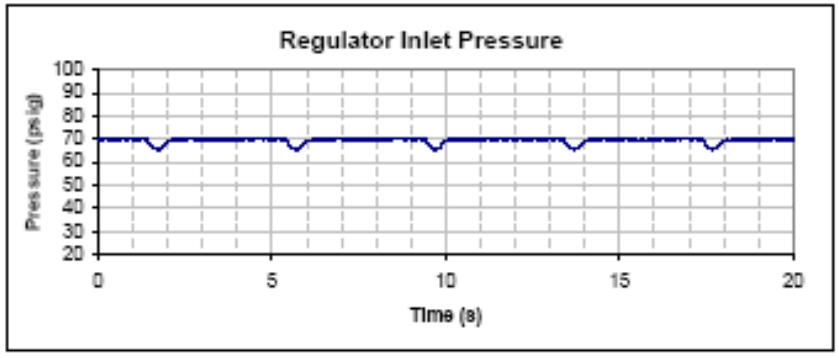
Breathing Rate (bpm)	15	Minute Volume (l)	20	Altitude	15
Stroke Volume (l)	1.33	Peak Inspired Flow (lpm)	200	Inlet Pressure (psig)	70
				Regulator Mode	Dilution

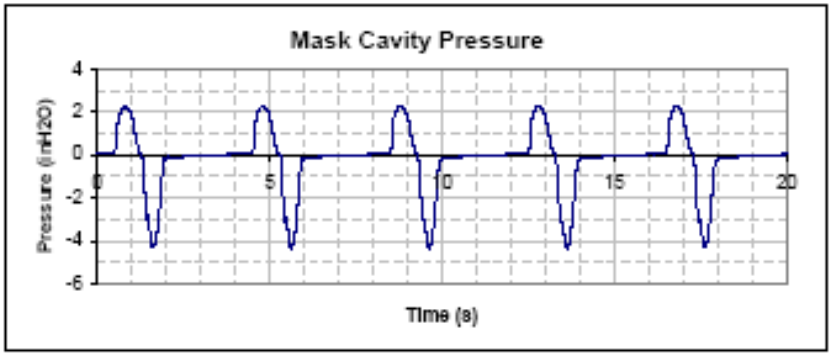






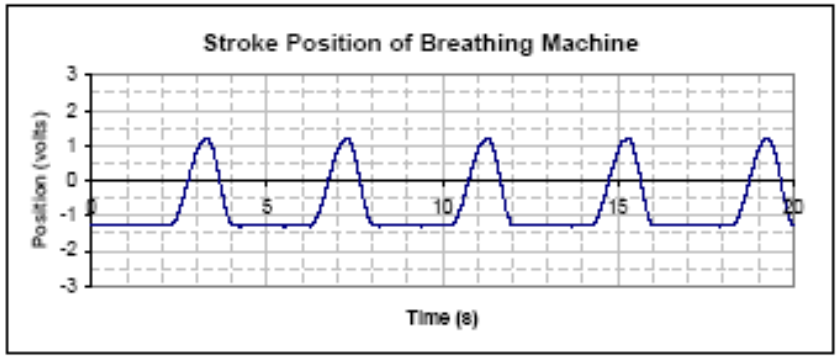


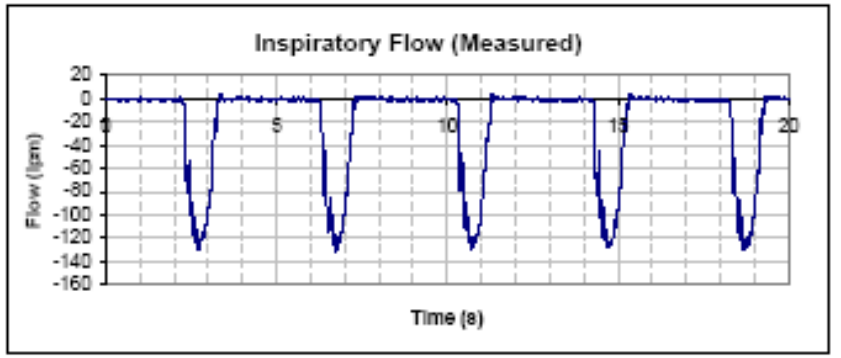


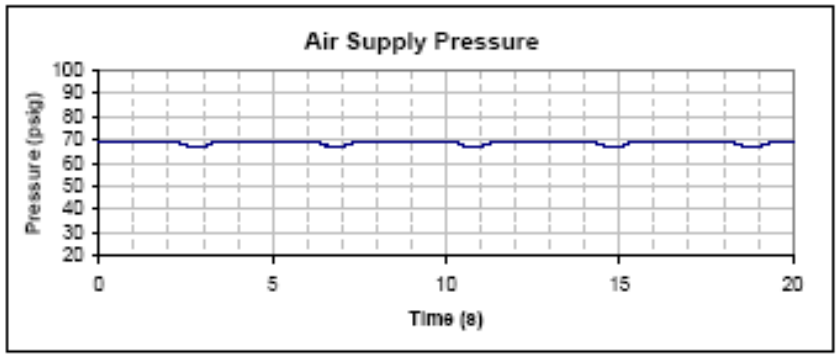


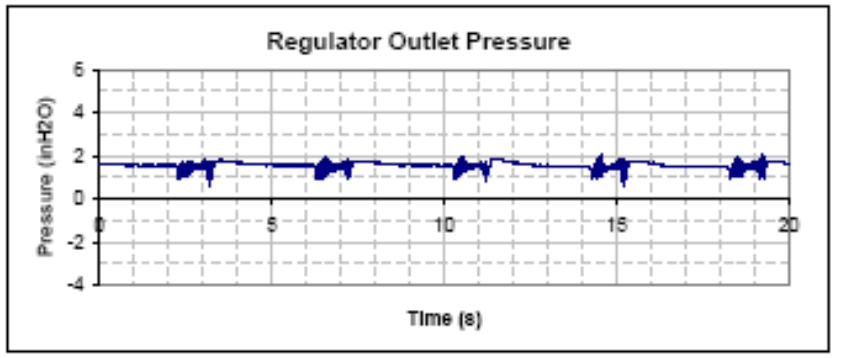
CF188 Oxygen System Compatability Test - NACES Configuration

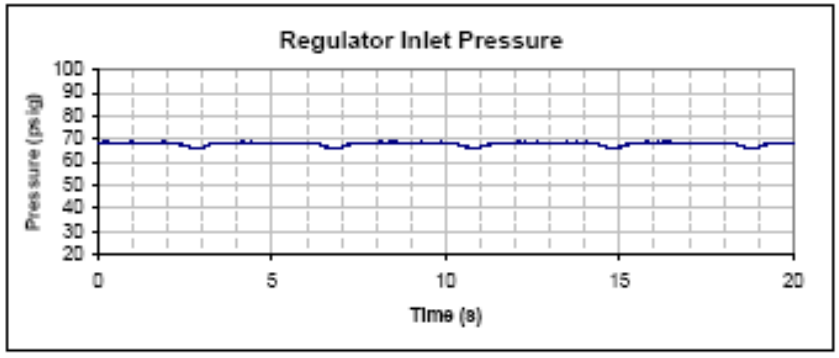
Group:	4 - Varied Altitude	Settings				Altitude	30
Test #:	41	Breathing Rate (bpm)	15	Minute Volume (l)	20	Inlet Pressure (psig)	70
		Stroke Volume (l)	1.33	Peak Inspired Flow (lpm)	120	Regulator Mode	Dilution

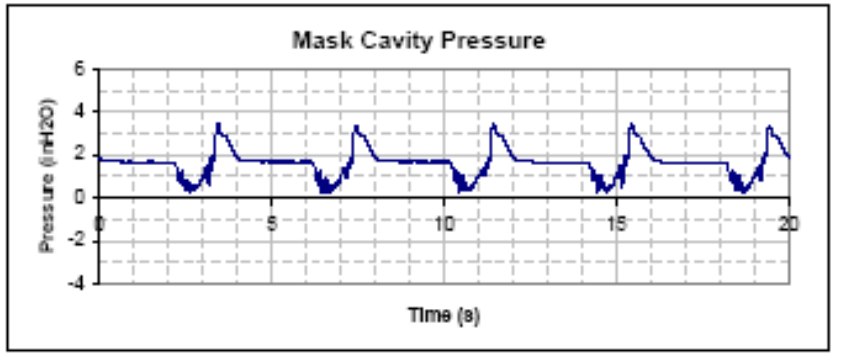










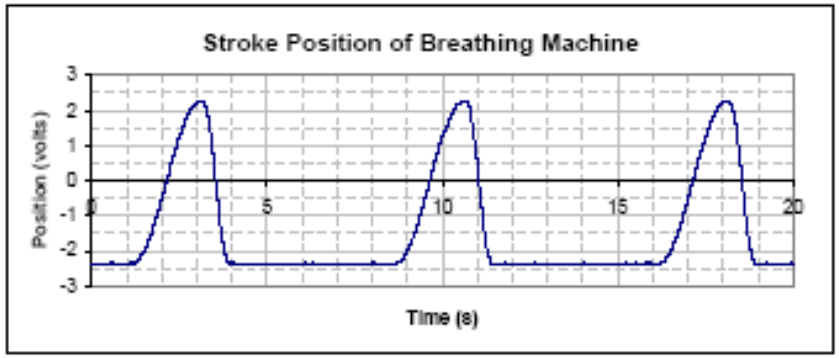


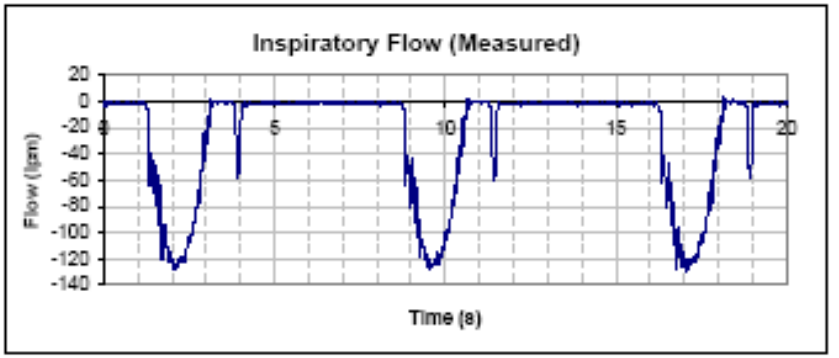
CF188 Oxygen System Compatability Test - NACES Configuration

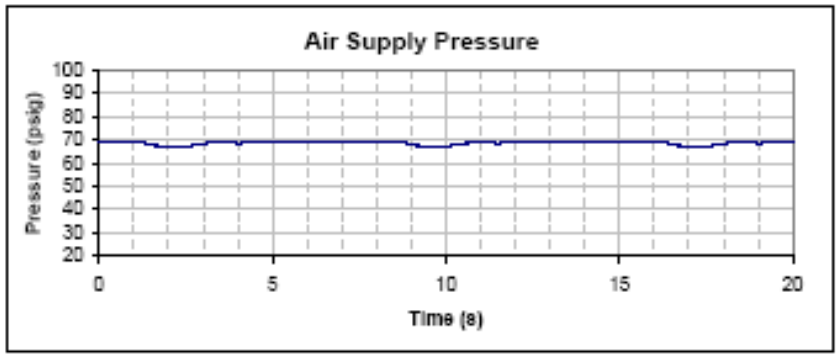
Group: 4 - Varied Altitude
Test #: 42

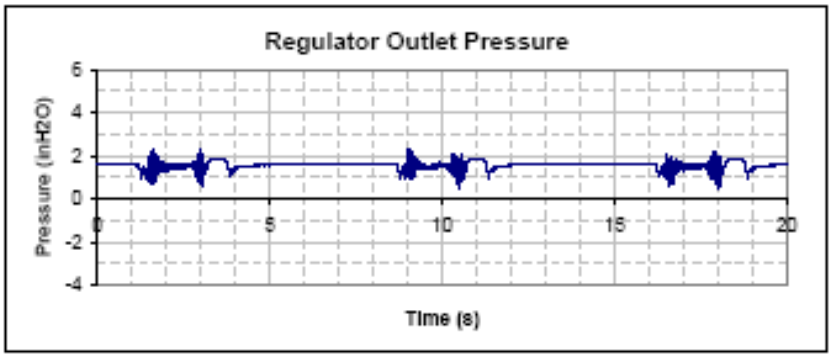
Settings

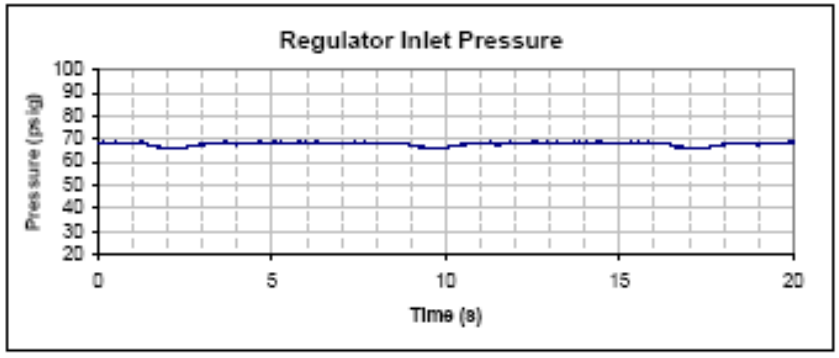
Breathing Rate (bpm)	8	Minute Volume (l)	20	Altitude	30
Stroke Volume (l)	2.5	Peak Inspired Flow (lpm)	120	Inlet Pressure (psig)	70
				Regulator Mode	Dilution

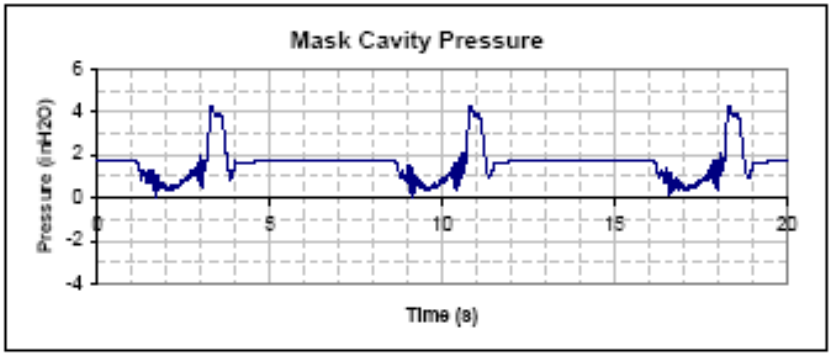






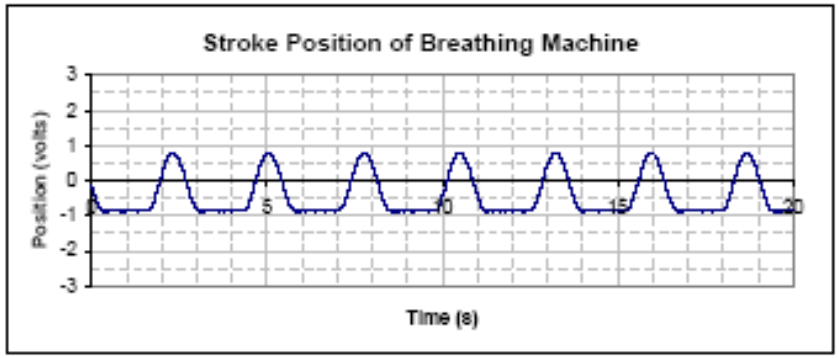


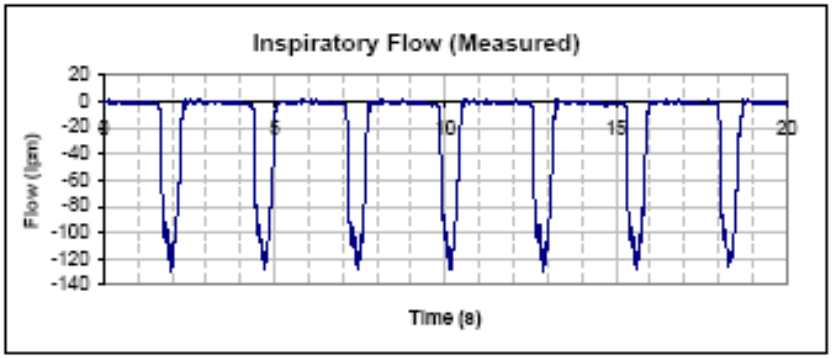


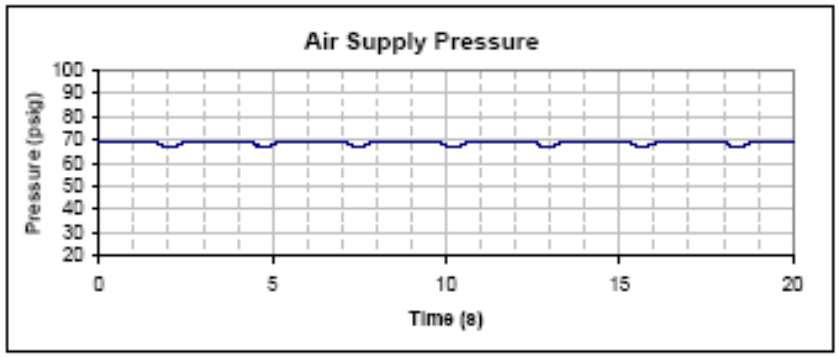


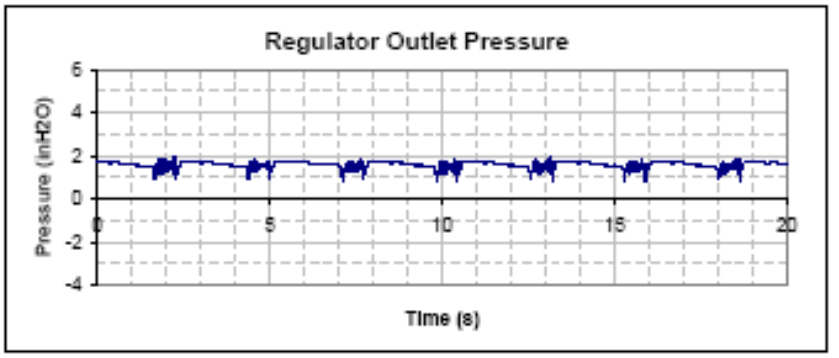
CF188 Oxygen System Compatability Test - NACES Configuration

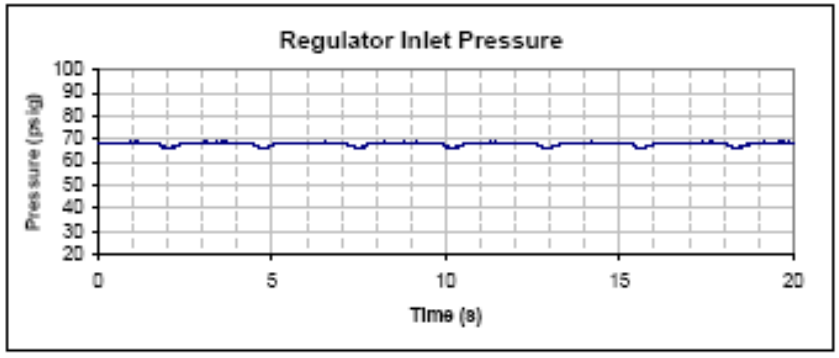
Group:	4 - Varied Altitude	Settings				Altitude	30
Test #:	43	Breathing Rate (bpm)	22	Minute Volume (l)	20	Inlet Pressure (psig)	70
		Stroke Volume (l)	0.91	Peak Inspired Flow (lpm)	120	Regulator Mode	Dilution

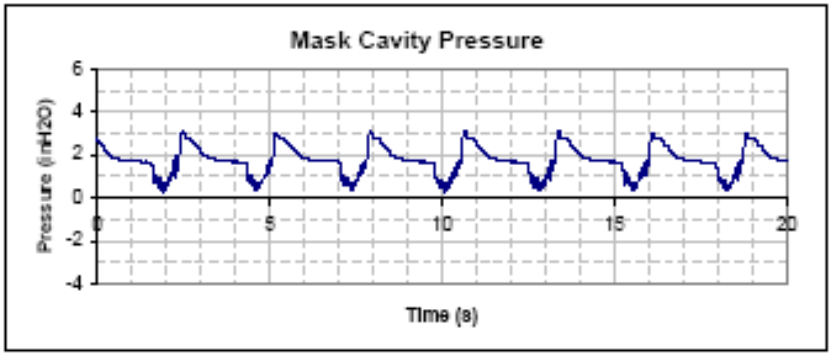










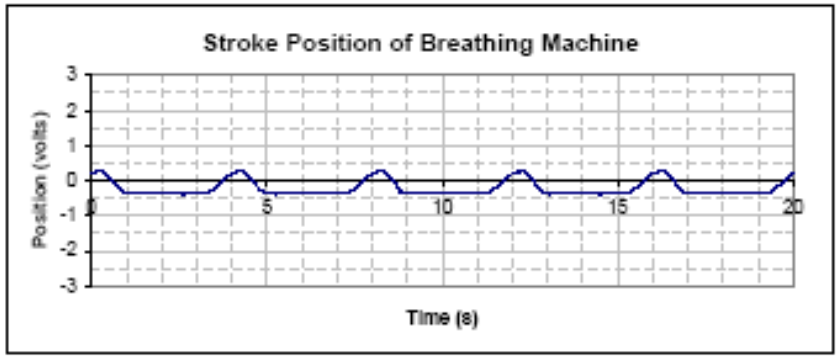


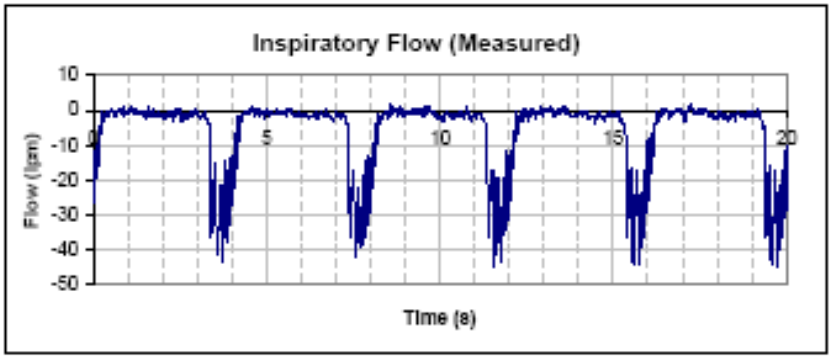
CF188 Oxygen System Compatability Test - NACES Configuration

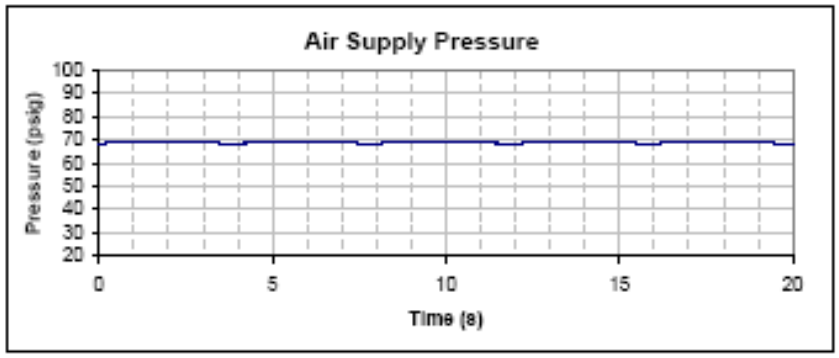
Group: 4 - Varied Altitude
Test #: 44

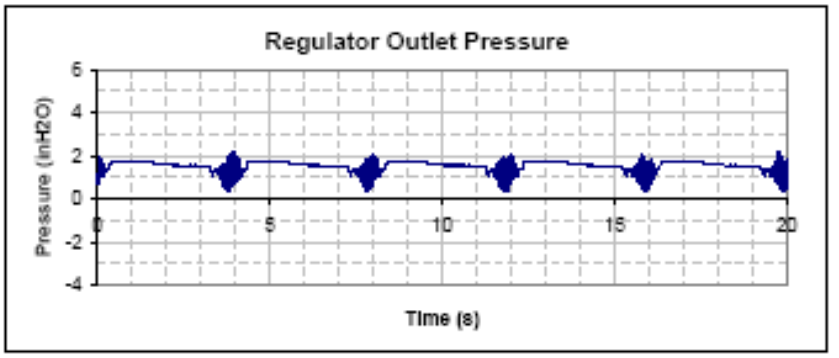
Settings

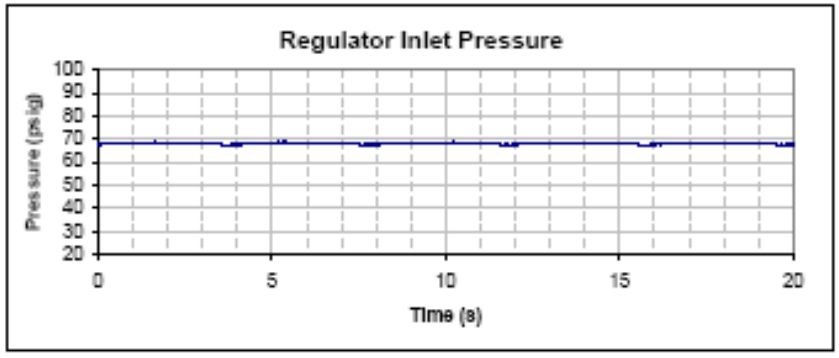
Breathing Rate (bpm)	15	Minute Volume (l)	5	Altitude	30
Stroke Volume (l)	0.33	Peak Inspired Flow (lpm)	30	Inlet Pressure (psig)	70
				Regulator Mode	Dilution

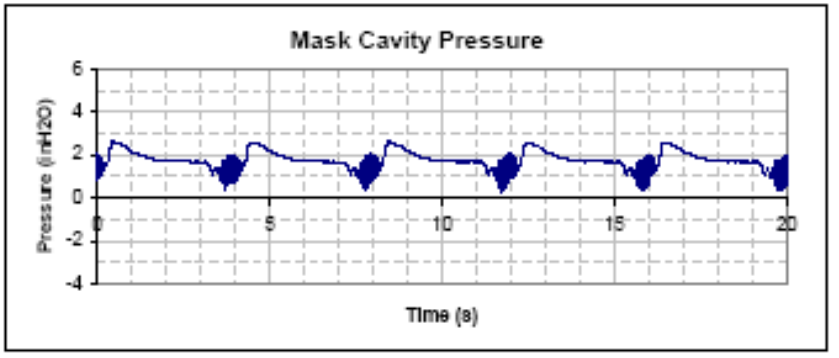






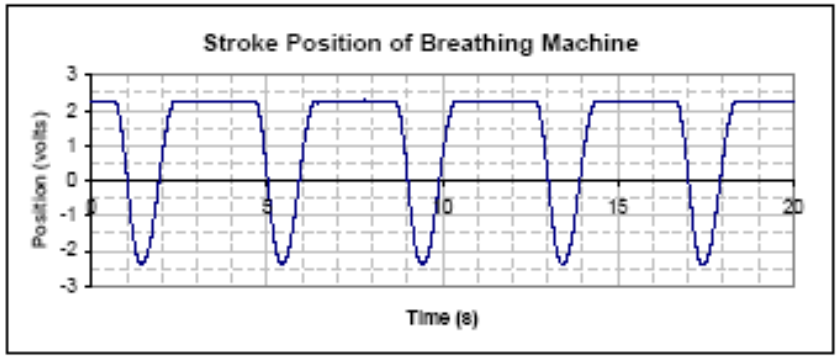


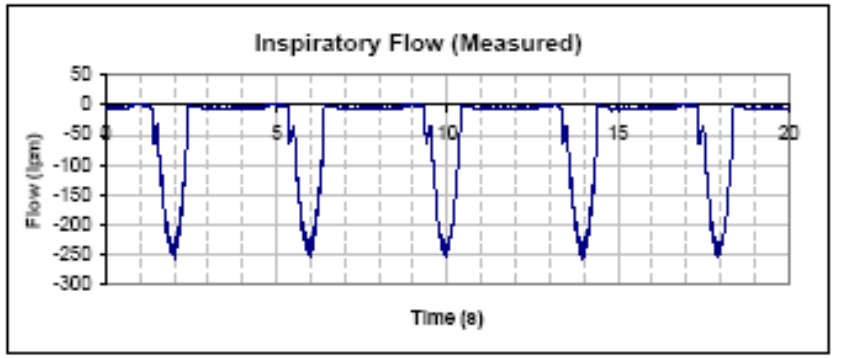


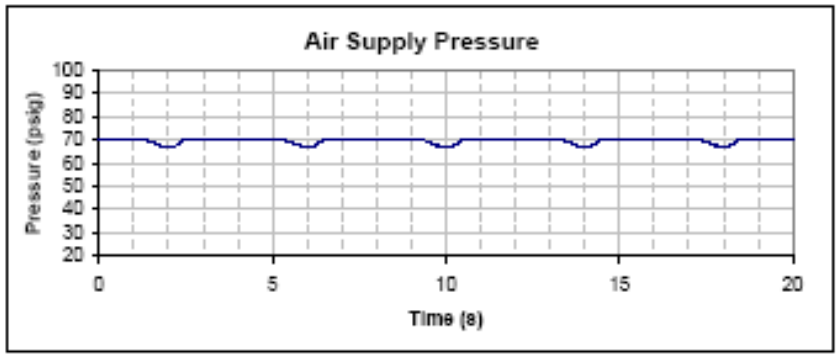


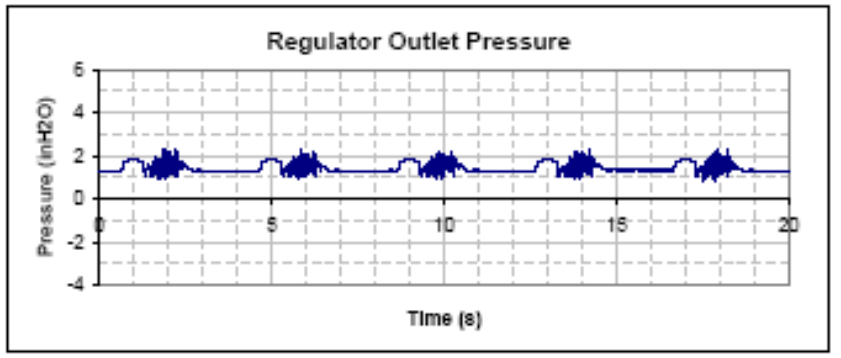
CF188 Oxygen System Compatability Test - NACES Configuration

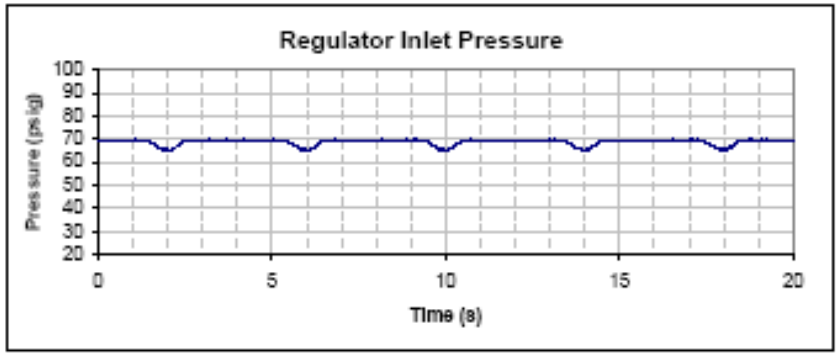
Group:	4 - Varied Altitude	Settings				Altitude	30
Test #:	45	Breathing Rate (bpm)	15	Minute Volume (l)	37.5	Inlet Pressure (psig)	70
		Stroke Volume (l)	2.5	Peak Inspired Flow (lpm)	250	Regulator Mode	Dilution

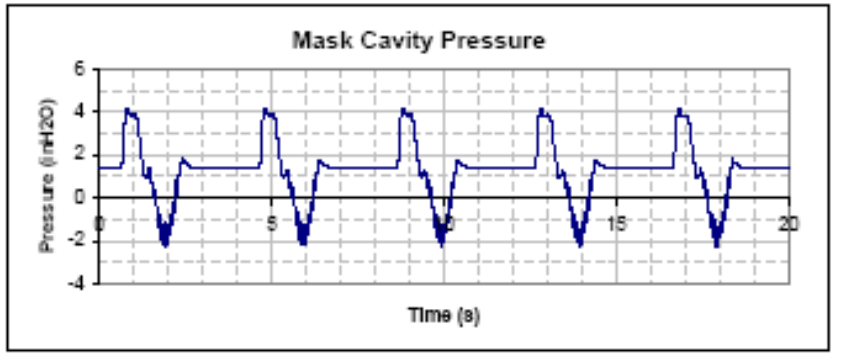






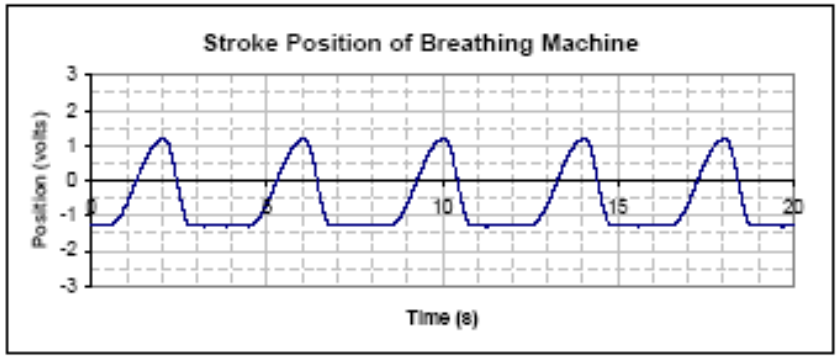


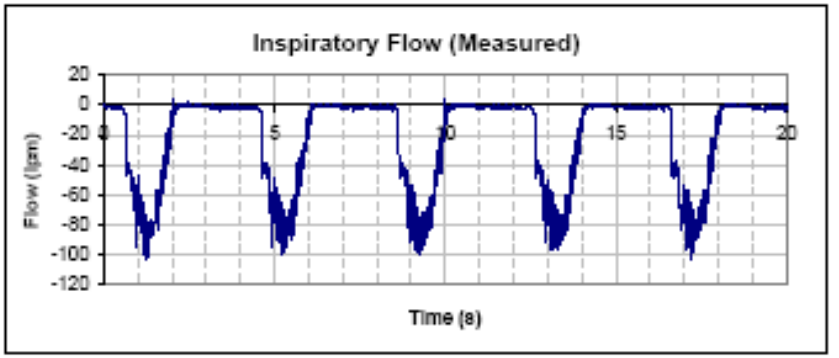


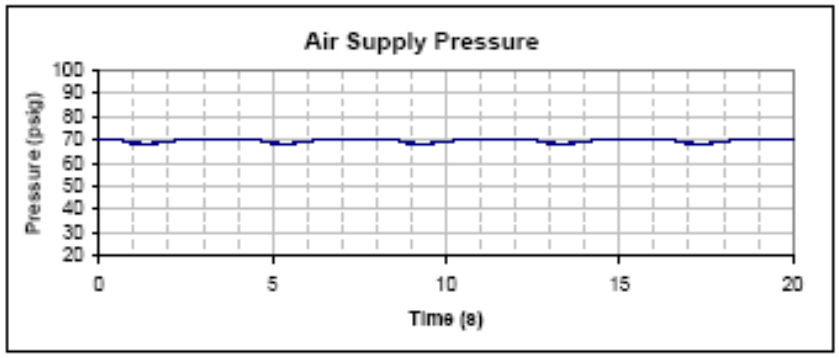


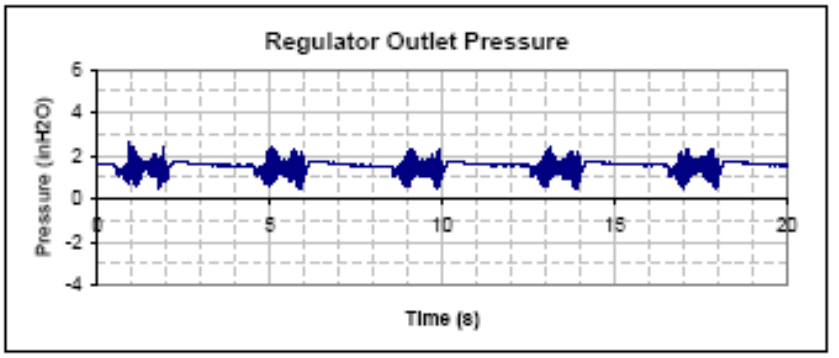
CF188 Oxygen System Compatability Test - NACES Configuration

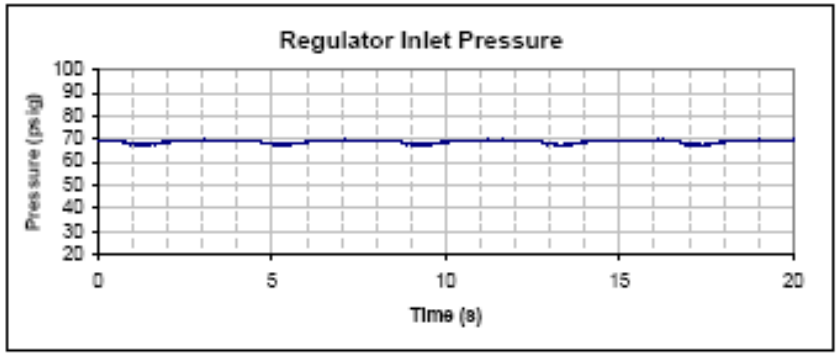
Group:	4 - Varied Altitude	Settings				Altitude	30
Test #:	46	Breathing Rate (bpm)	15	Minute Volume (l)	20	Inlet Pressure (psig)	70
		Stroke Volume (l)	1.33	Peak Inspired Flow (lpm)	80	Regulator Mode	Dilution

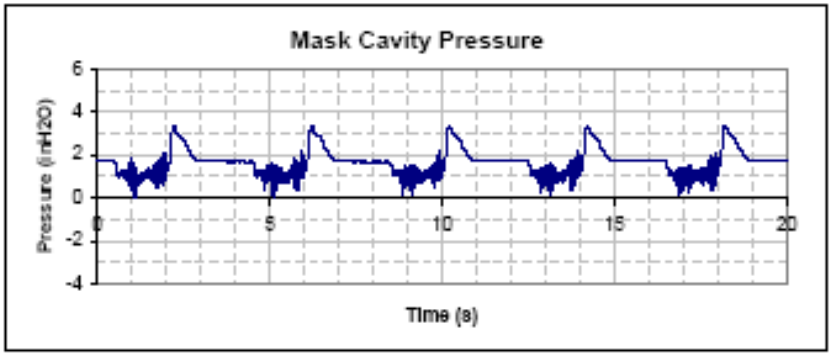






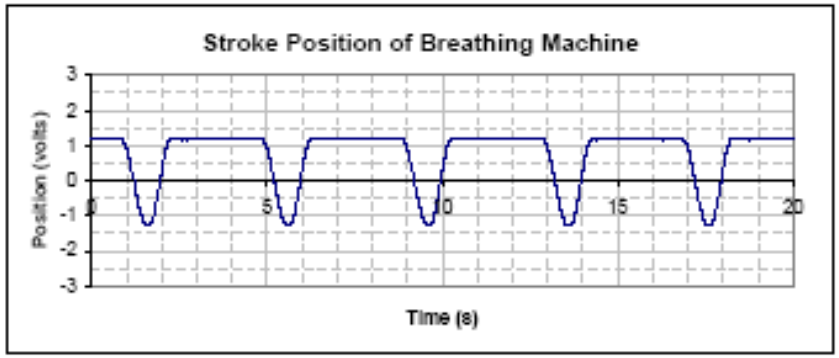


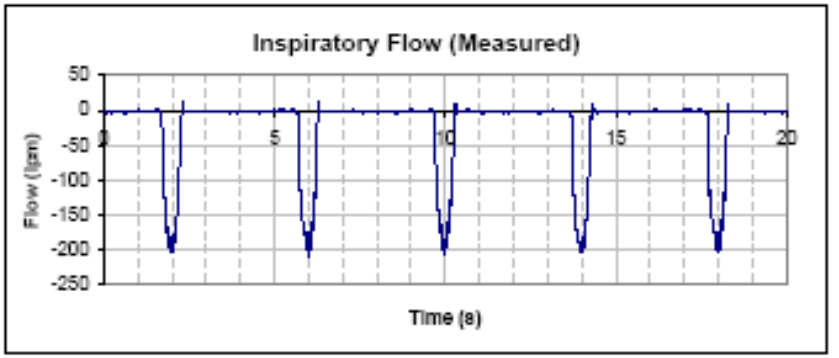


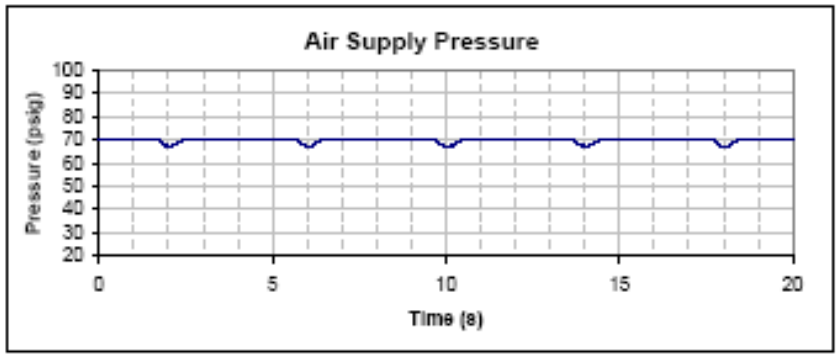


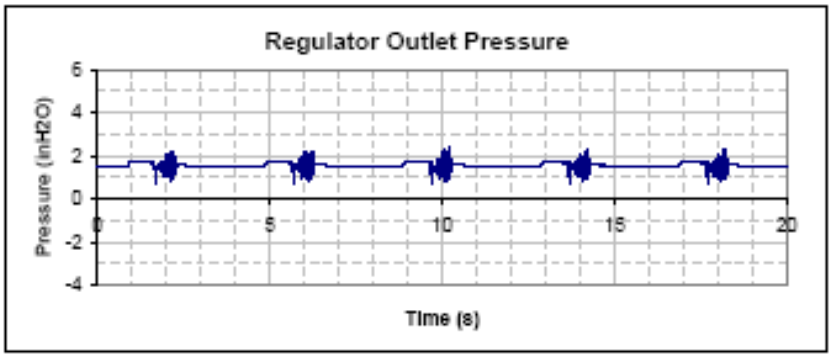
CF188 Oxygen System Compatability Test - NACES Configuration

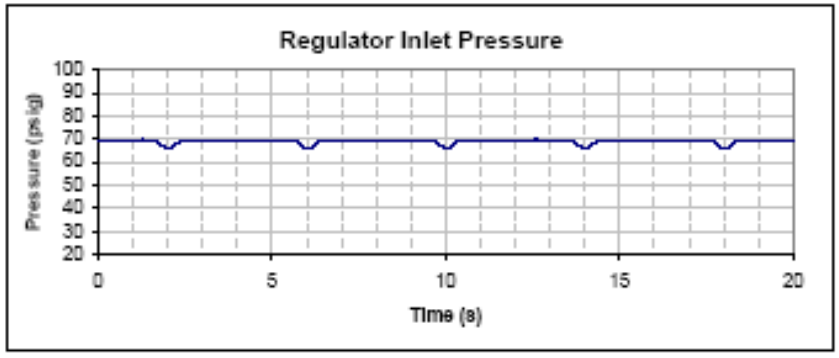
Group:	4 - Varied Altitude	Settings				Altitude	30
Test #:	47	Breathing Rate (bpm)	15	Minute Volume (l)	20	Inlet Pressure (psig)	70
		Stroke Volume (l)	1.33	Peak Inspired Flow (lpm)	200	Regulator Mode	Dilution

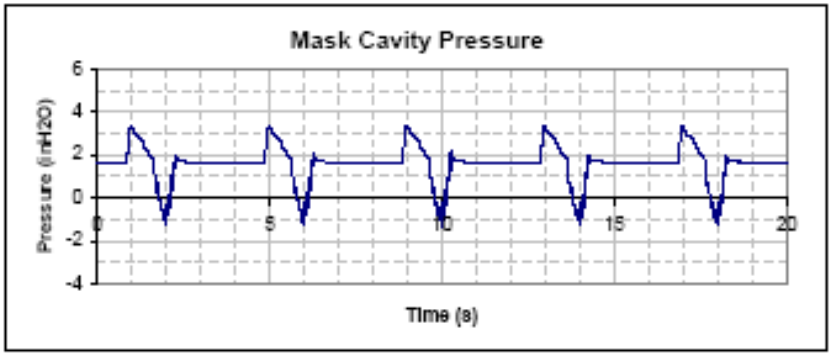










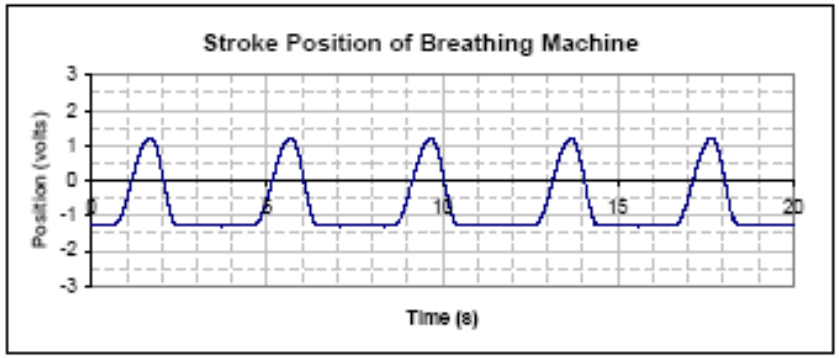


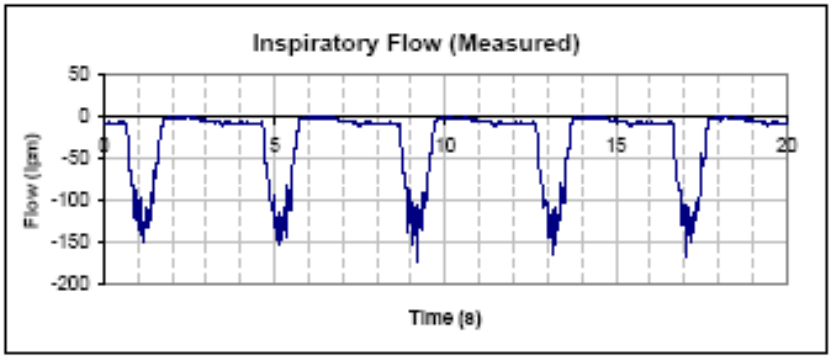
CF188 Oxygen System Compatability Test - NACES Configuration

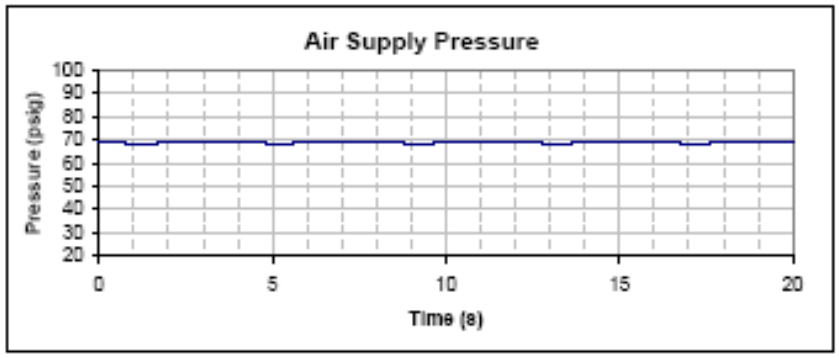
Group: 4 - Varied Altitude
Test #: 48

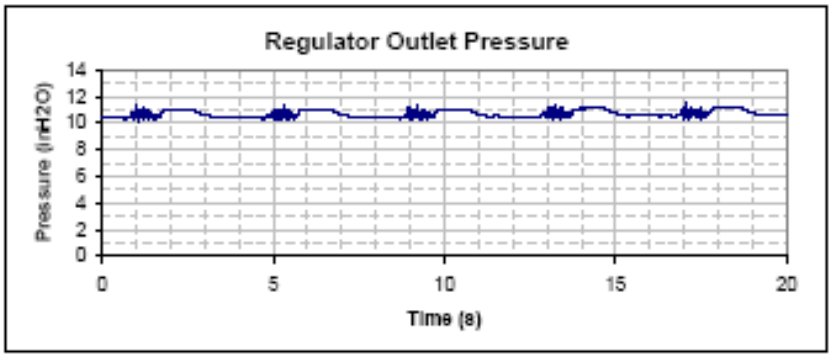
Settings

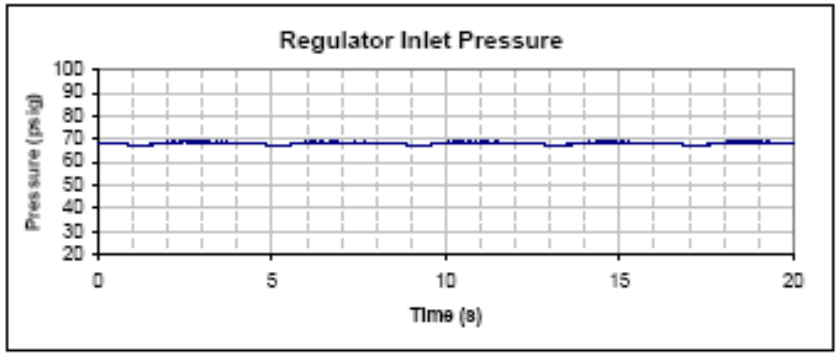
Breathing Rate (bpm)	15	Minute Volume (l)	20	Altitude	45
Stroke Volume (l)	1.33	Peak Inspired Flow (lpm)	120	Inlet Pressure (psig)	70
				Regulator Mode	Dilution

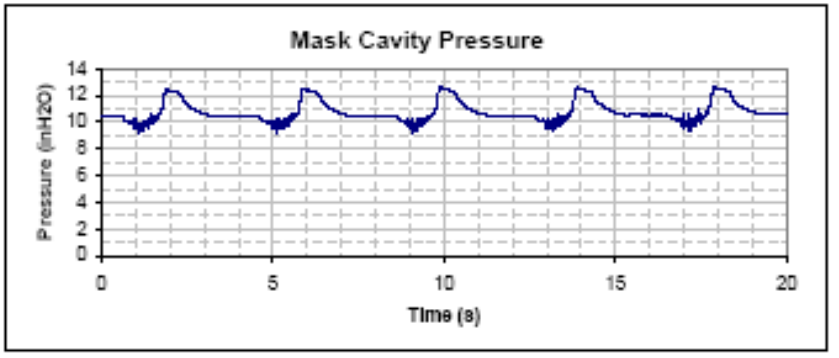






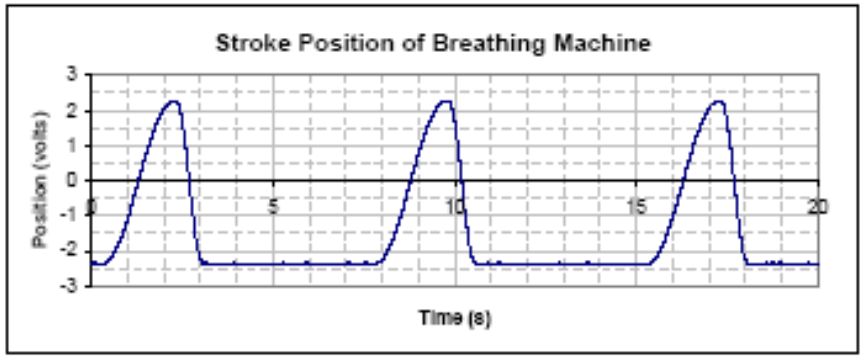


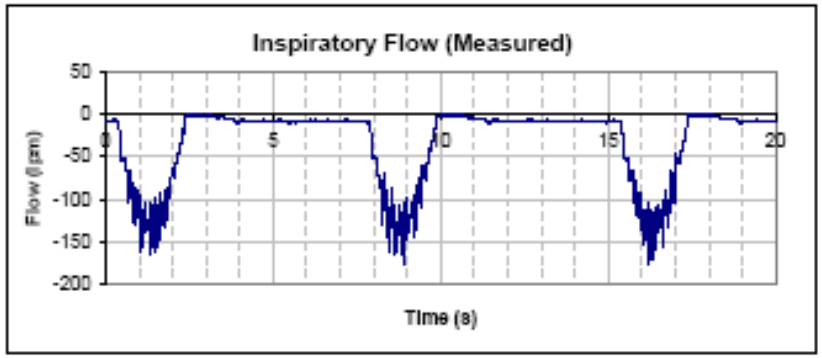


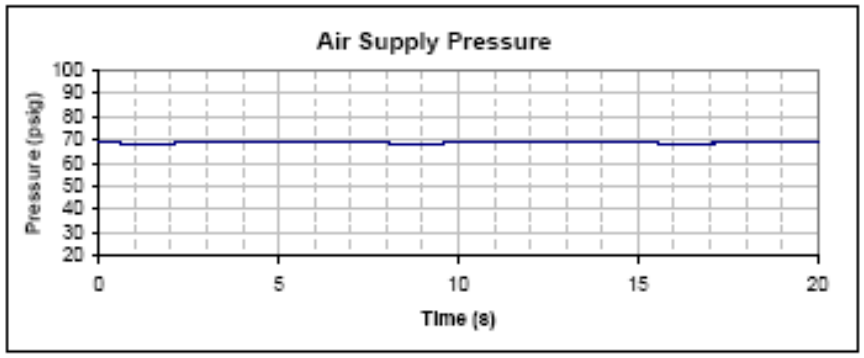


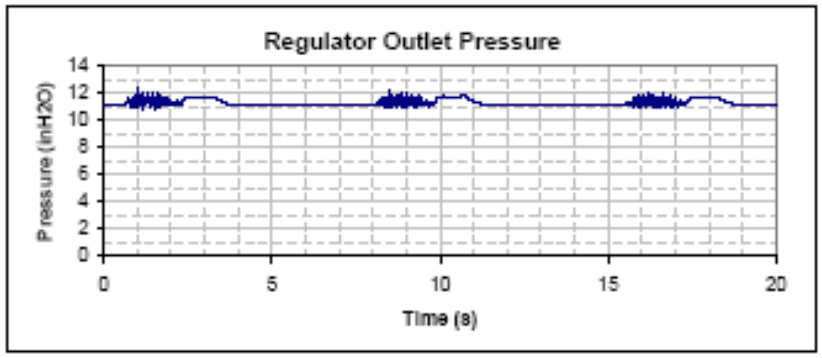
CF188 Oxygen System Compatability Test - NACES Configuration

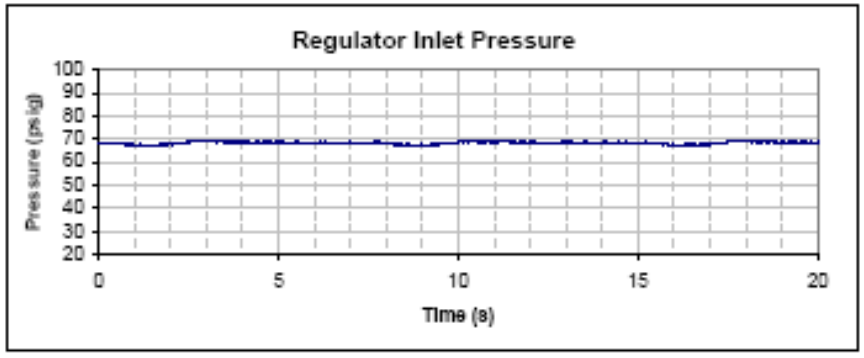
Group: 4 - Varied Altitude		Settings				Altitude	45
Test #:	49	Breathing Rate (bpm)	8	Minute Volume (l)	20	Inlet Pressure (psig)	70
		Stroke Volume (l)	2.5	Peak Inspired Flow (lpm	120	Regulator Mode	Dilution

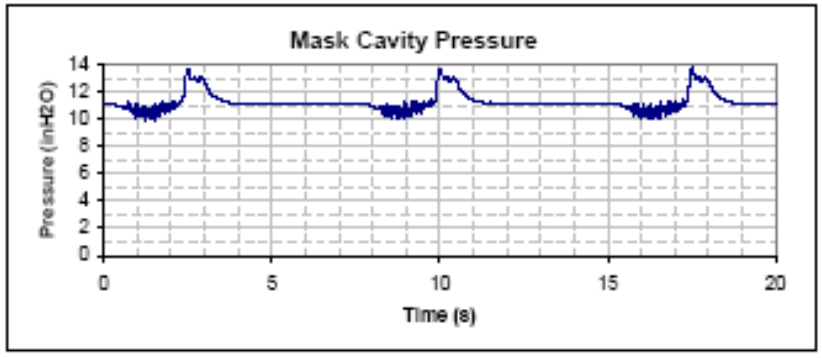






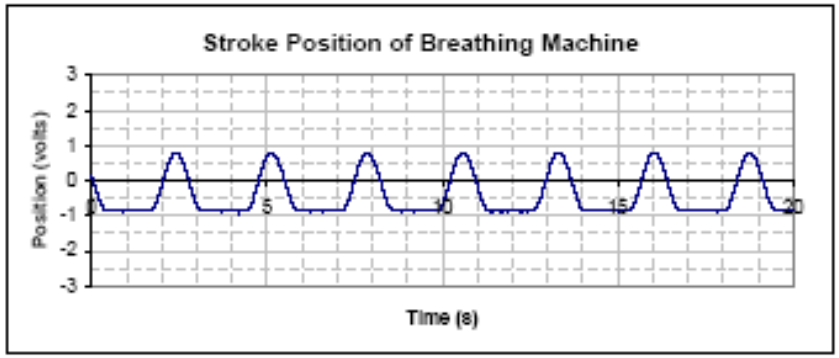


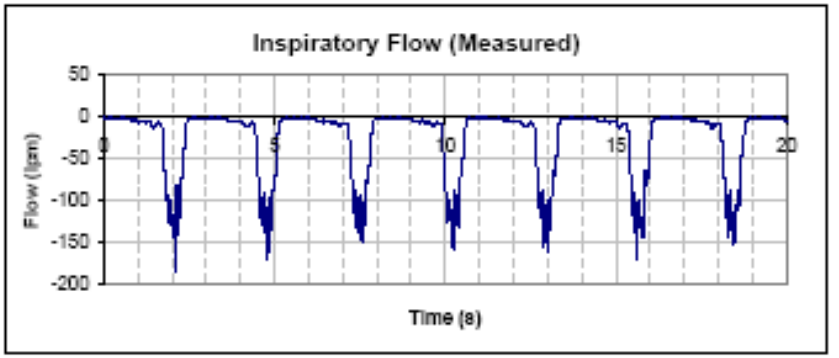


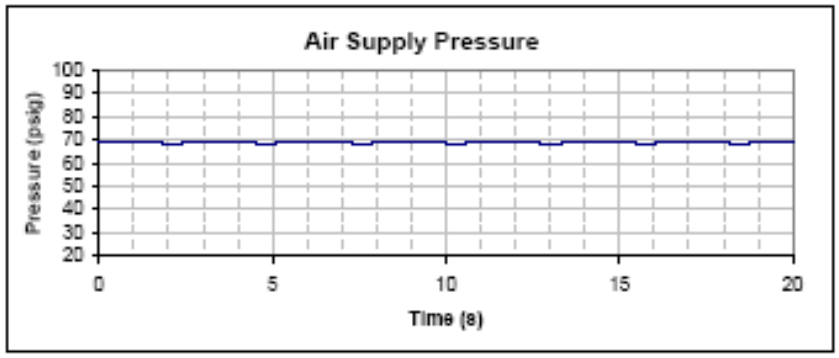


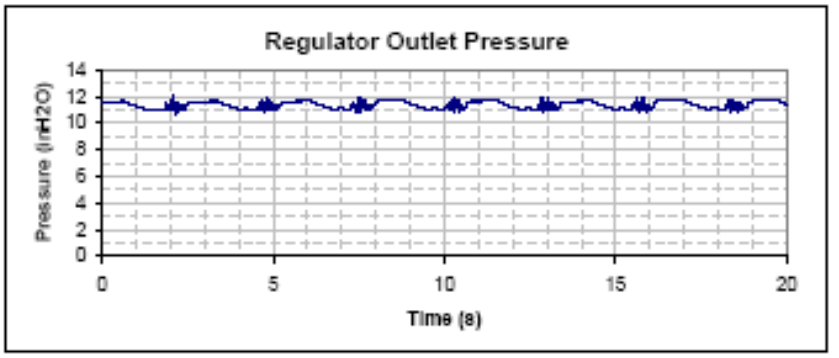
CF188 Oxygen System Compatability Test - NACES Configuration

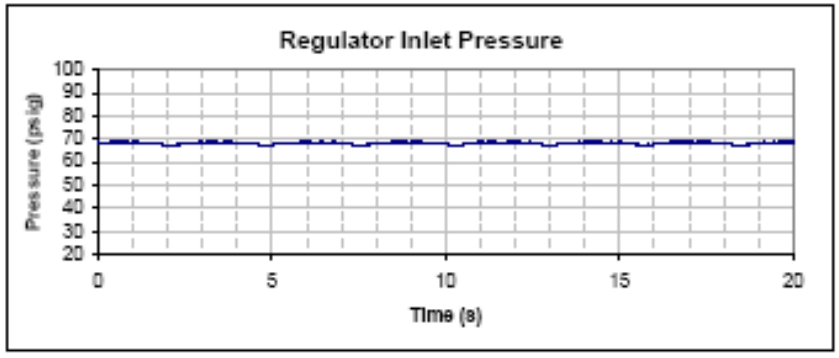
Group: 4 - Varied Altitude		Settings				Altitude	45
Test #:	50	Breathing Rate (bpm)	22	Minute Volume (l)	20	Inlet Pressure (psig)	70
		Stroke Volume (l)	0.91	Peak Inspired Flow (lpm)	120	Regulator Mode	Dilution

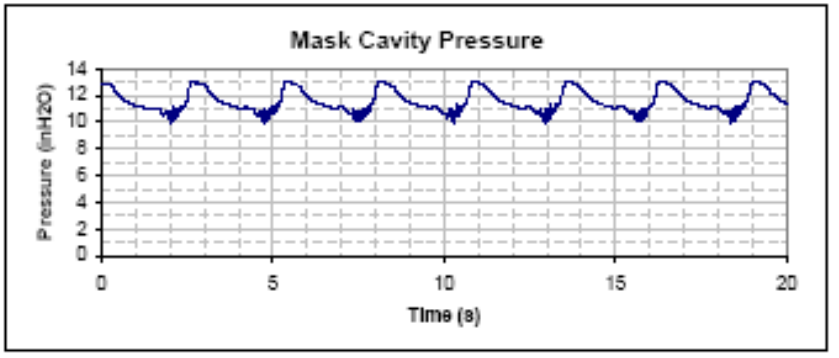






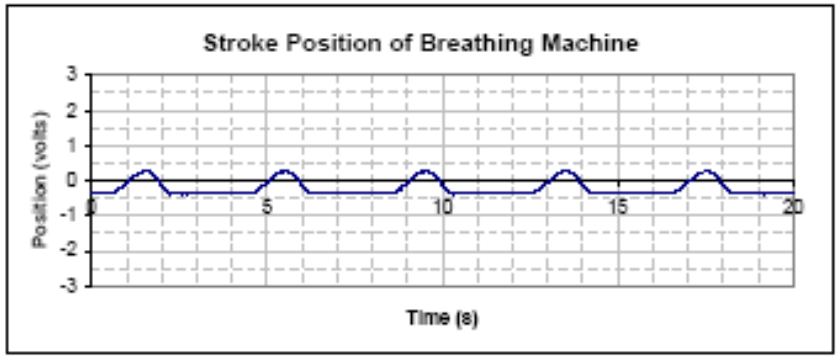


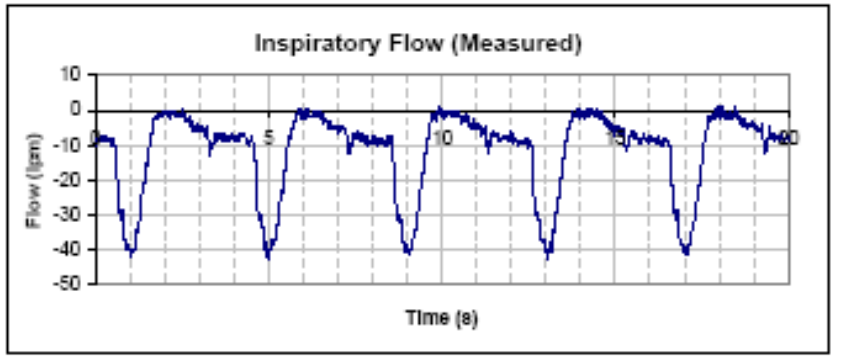


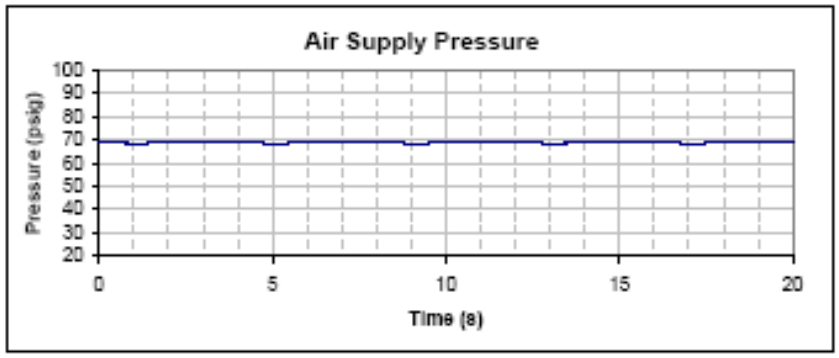


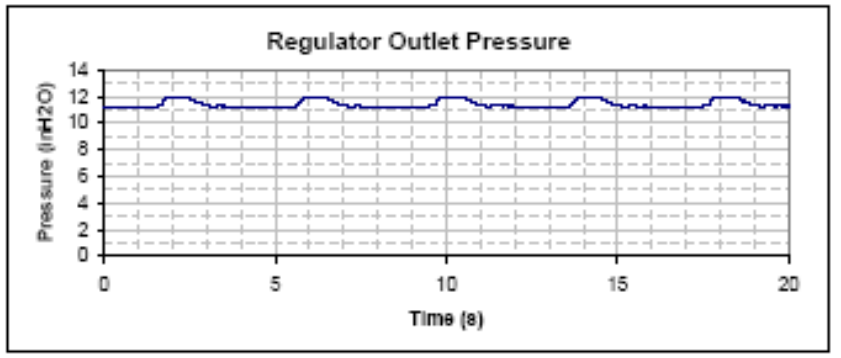
CF188 Oxygen System Compatability Test - NACES Configuration

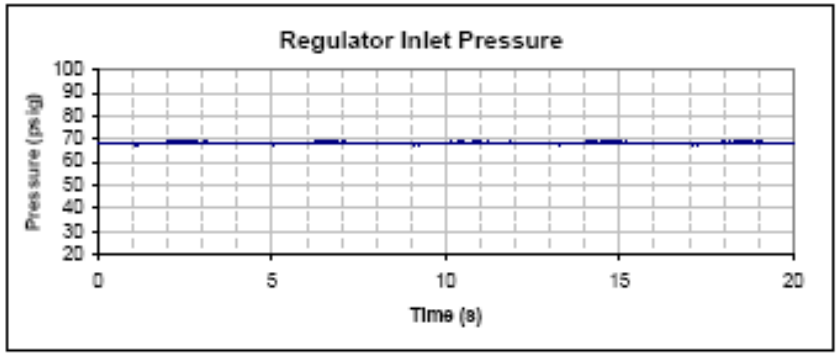
Group: 4 - Varied Altitude		Settings				Altitude	45
Test #:	51	Breathing Rate (bpm)	15	Minute Volume (l)	5	Inlet Pressure (psig)	70
		Stroke Volume (l)	0.33	Peak Inspired Flow (lpm)	30	Regulator Mode	Dilution

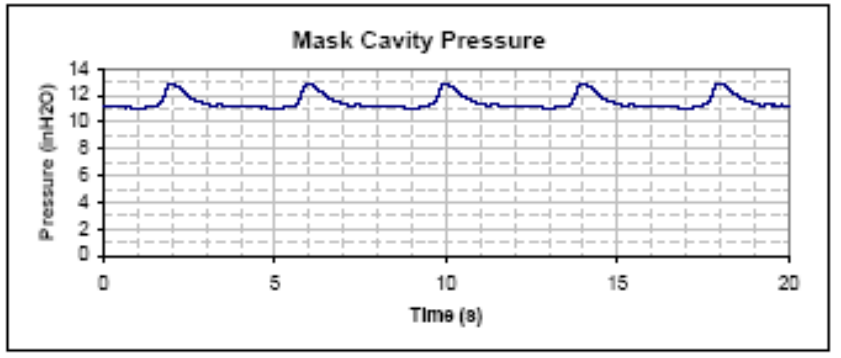






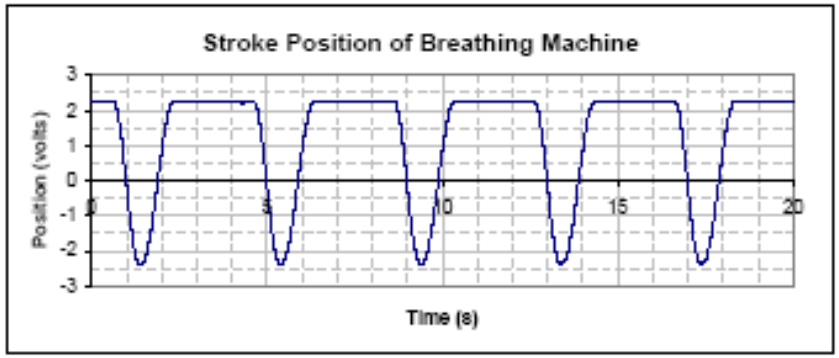


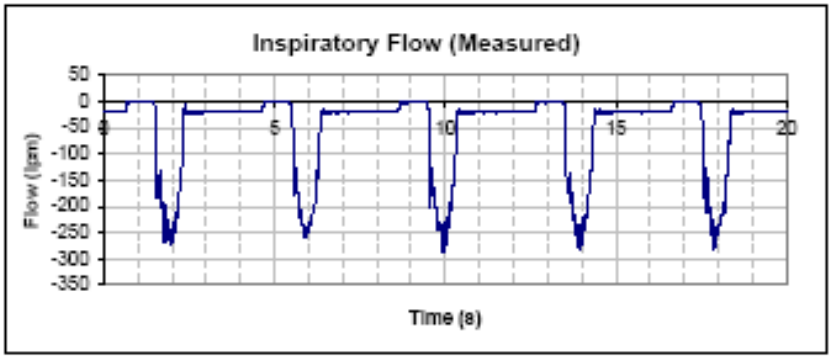


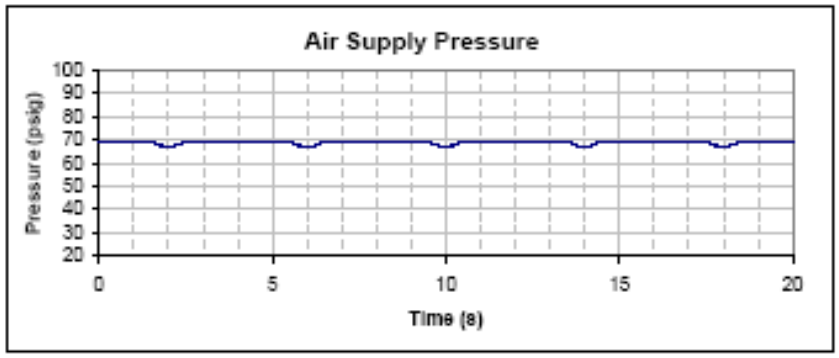


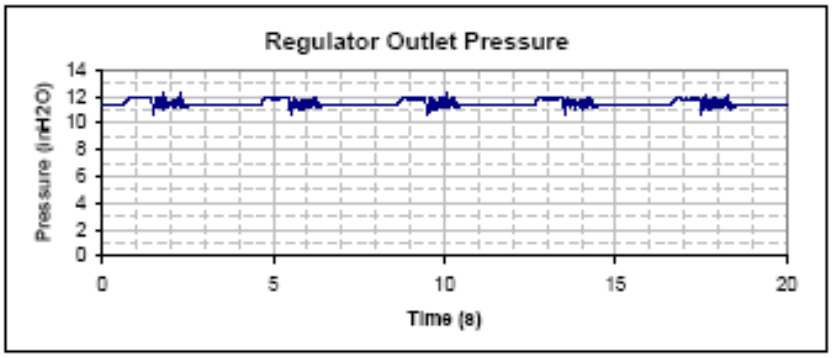
CF188 Oxygen System Compatability Test - NACES Configuration

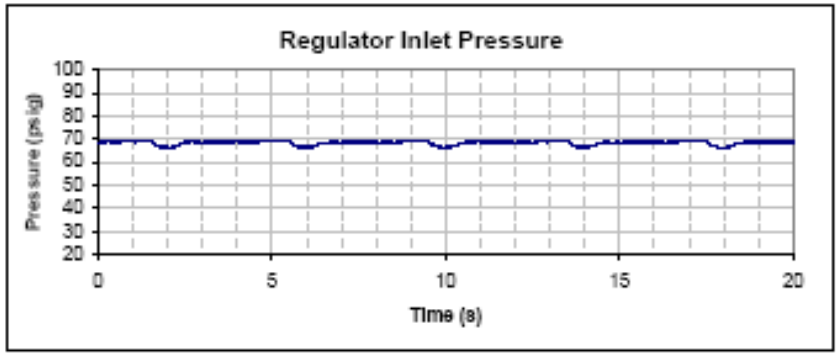
Group: 4 - Varied Altitude		Settings				Altitude	45
Test #:	52	Breathing Rate (bpm)	15	Minute Volume (l)	37.5	Inlet Pressure (psig)	70
		Stroke Volume (l)	2.5	Peak Inspired Flow (lpm)	250	Regulator Mode	Dilution

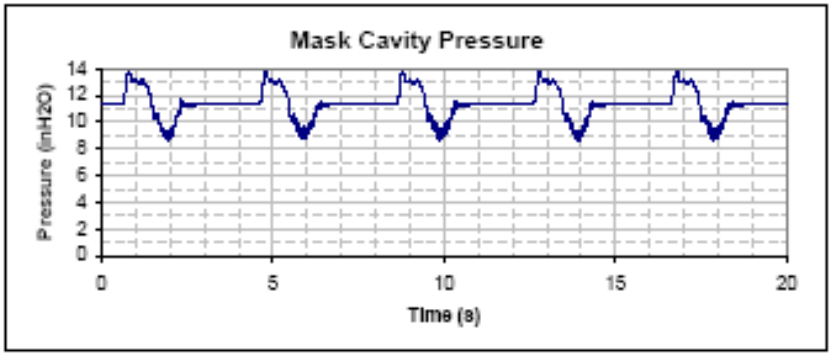






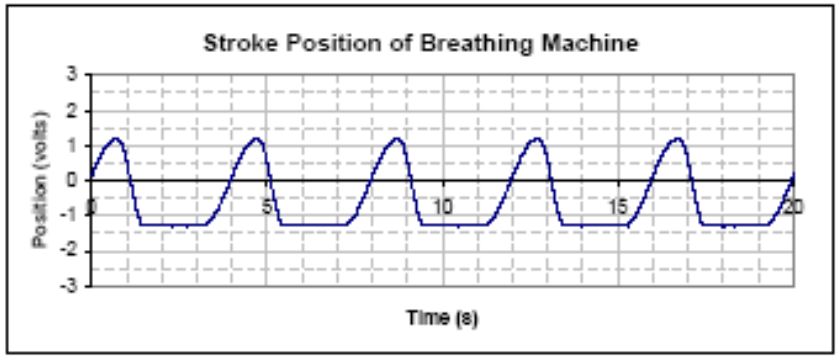


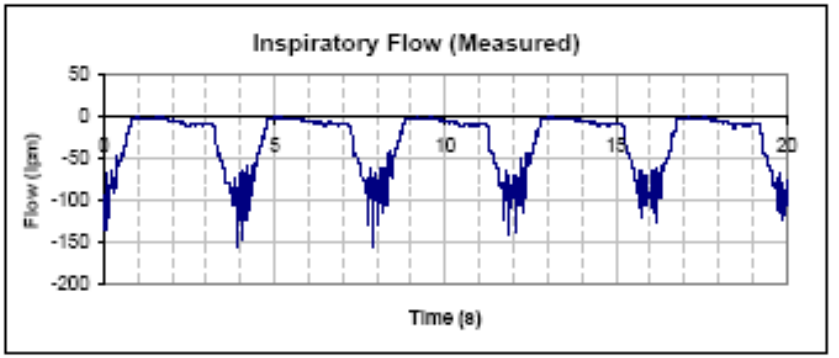


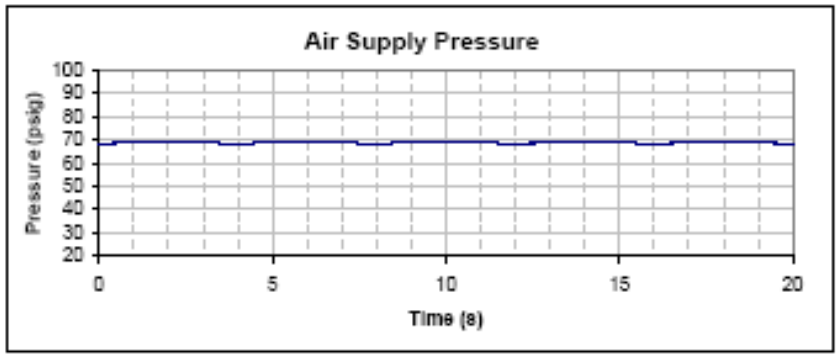


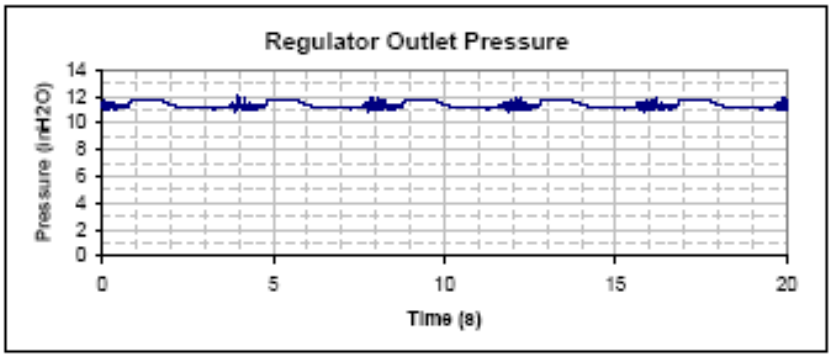
CF188 Oxygen System Compatability Test - NACES Configuration

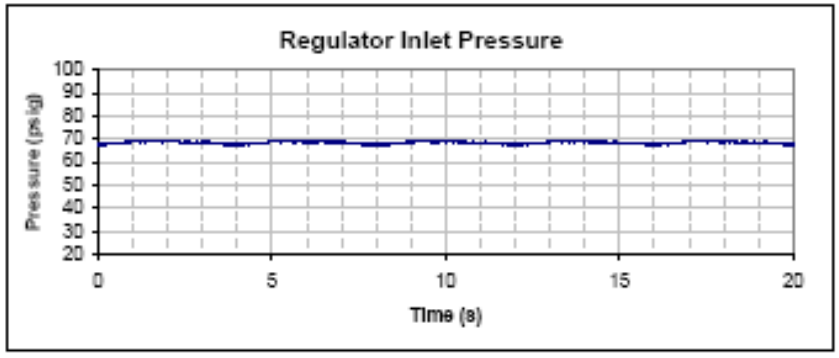
Group: 4 - Varied Altitude		Settings				Altitude	45
Test #:	53	Breathing Rate (bpm)	15	Minute Volume (l)	20	Inlet Pressure (psig)	70
		Stroke Volume (l)	1.33	Peak Inspired Flow (lpm)	80	Regulator Mode	Dilution

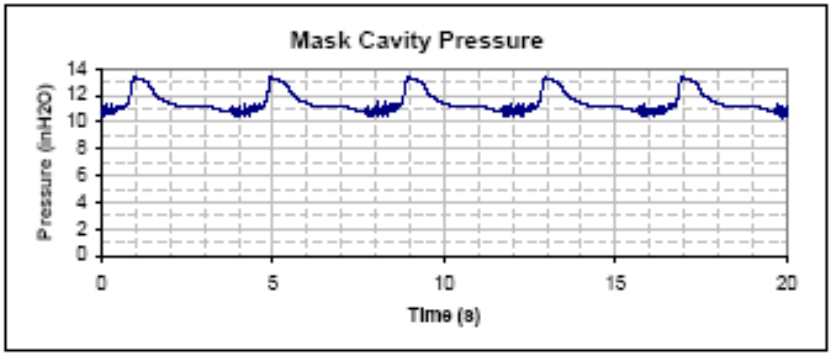






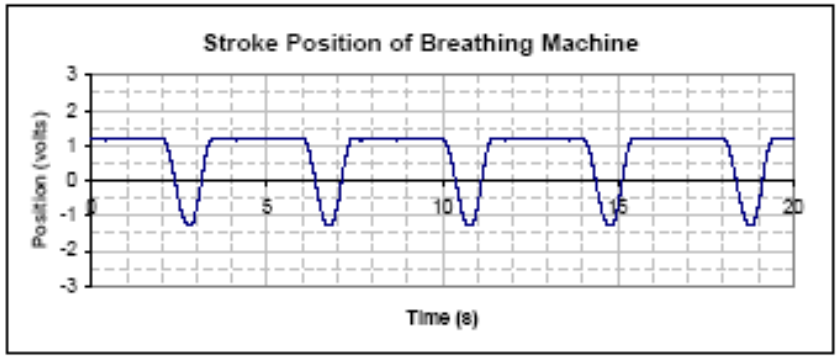


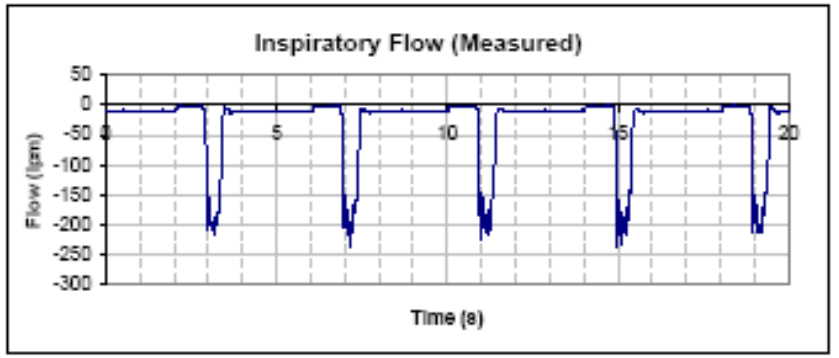


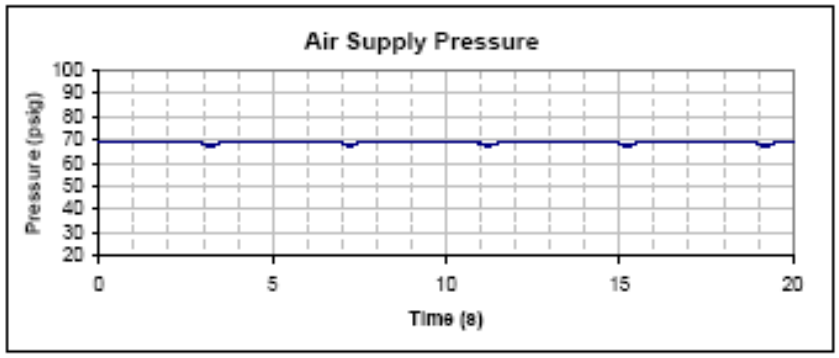


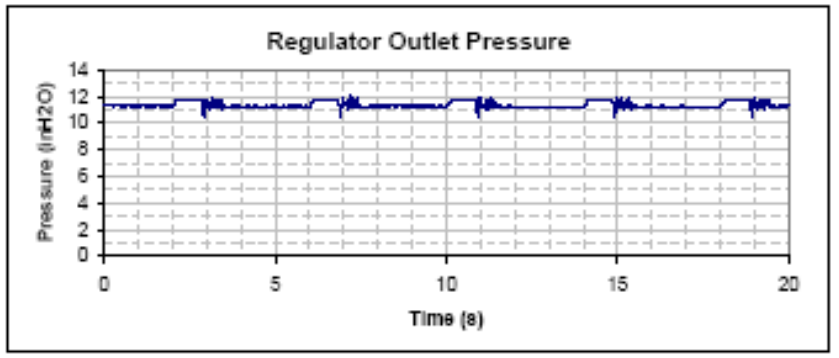
CF188 Oxygen System Compatability Test - NACES Configuration

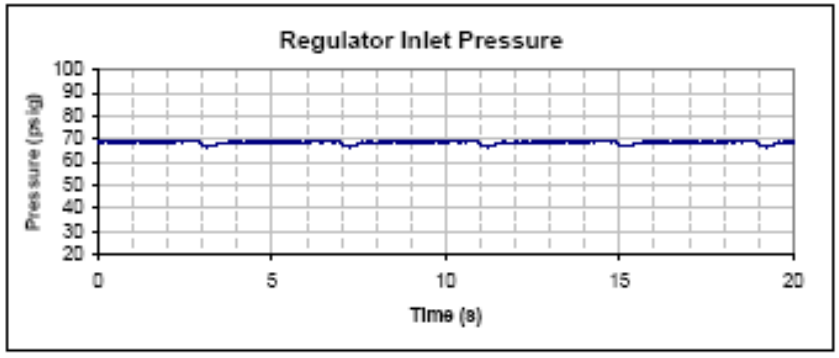
Group: 4 - Varied Altitude		Settings				Altitude	45
Test #:	54	Breathing Rate (bpm)	15	Minute Volume (l)	20	Inlet Pressure (psig)	70
		Stroke Volume (l)	1.33	Peak Inspired Flow (lpm)	200	Regulator Mode	Dilution

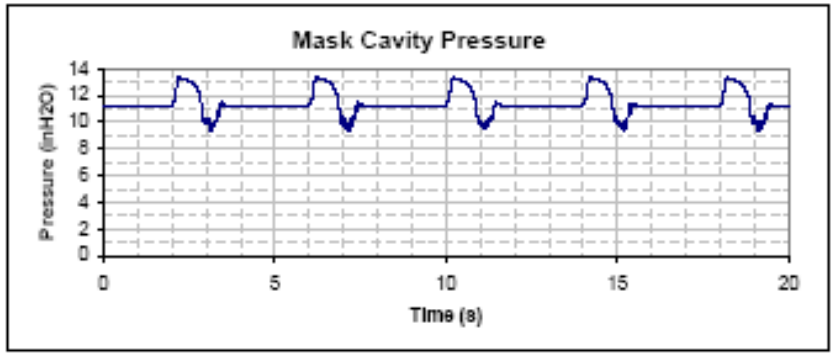






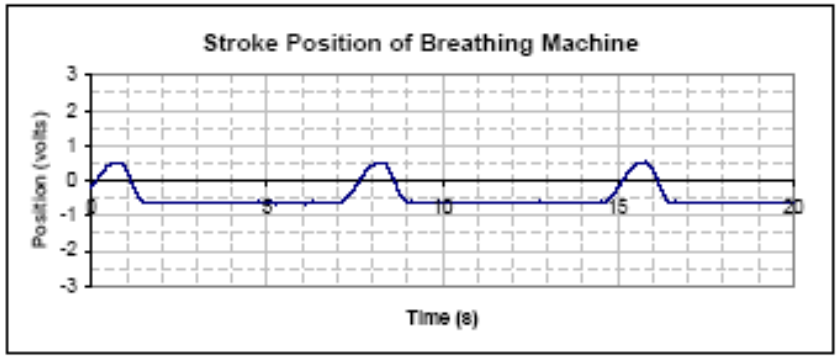


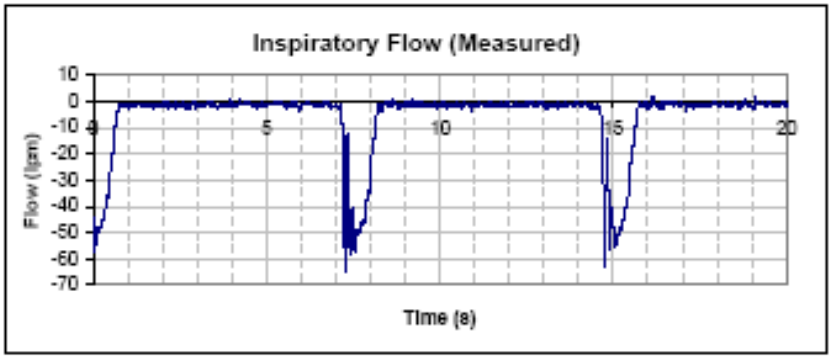


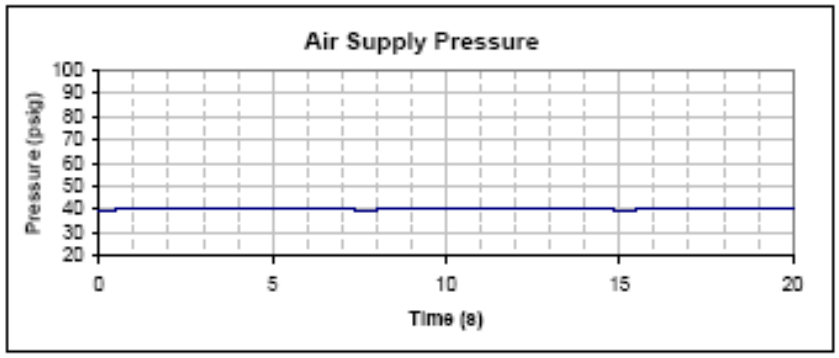


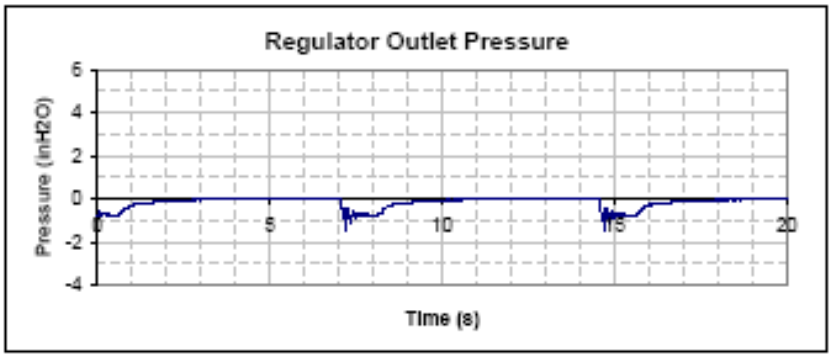
CF188 Oxygen System Compatability Test - NACES Configuration

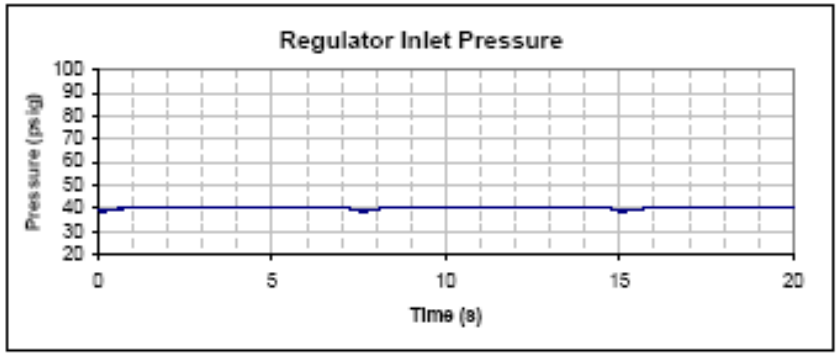
Group:	5 - Multi Extremes	Settings				Altitude	7.5
Test #:	55	Breathing Rate (bpm)	8	Minute Volume (l)	5	Inlet Pressure (psig)	40
		Stroke Volume (l)	0.625	Peak Inspired Flow (lpm)	50	Regulator Mode	Dilution

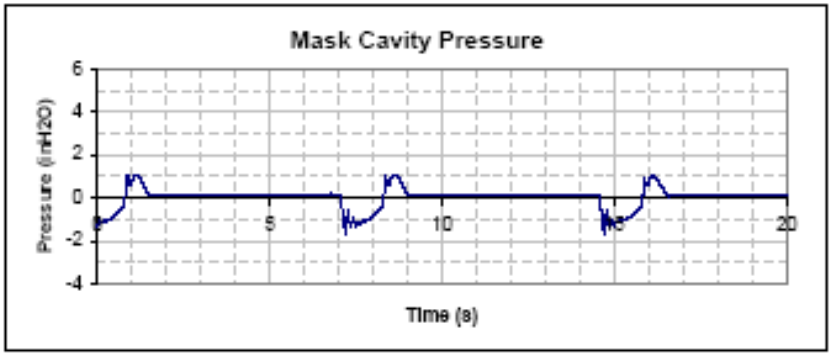






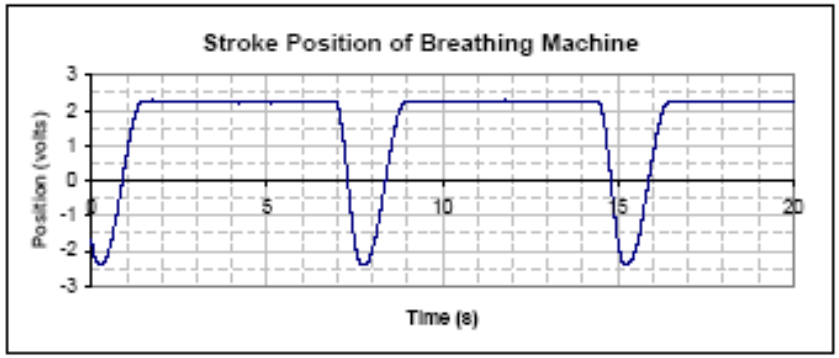


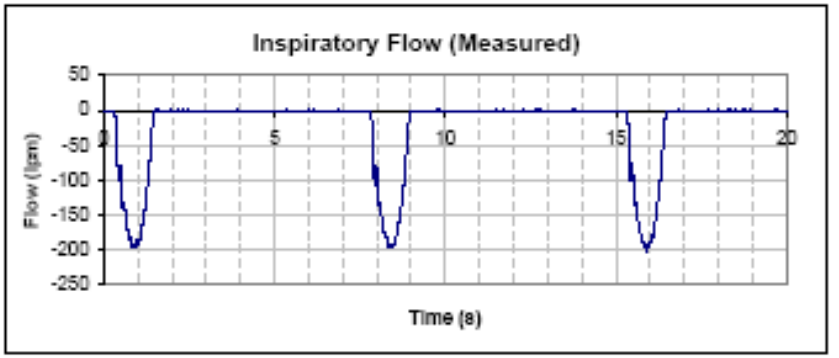


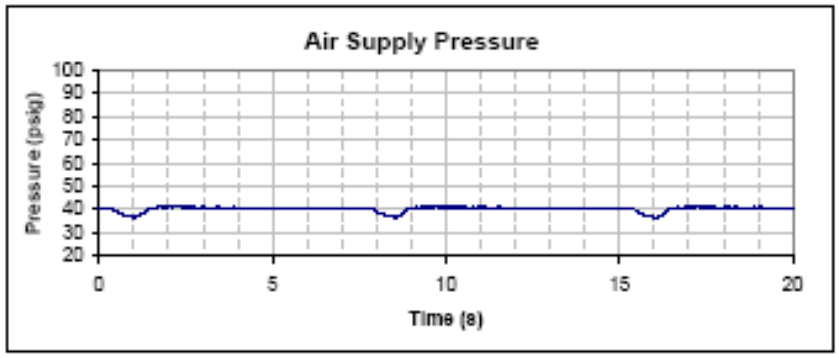


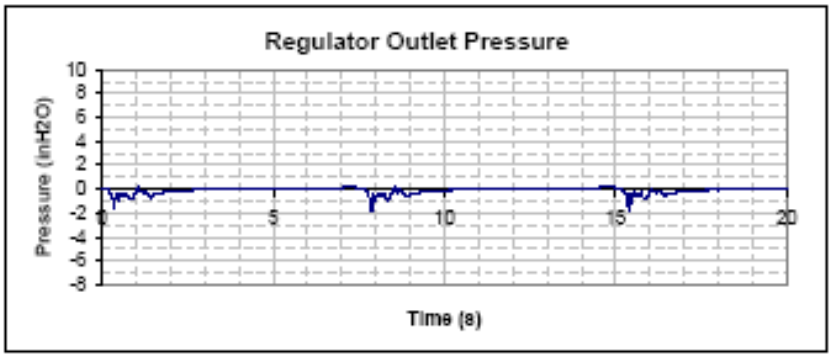
CF188 Oxygen System Compatability Test - NACES Configuration

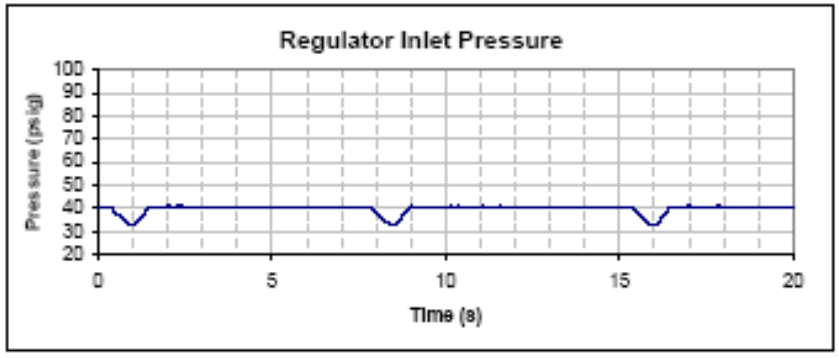
Group:	5 - Multi Extremes	Settings				Altitude	7.5
Test #:	56	Breathing Rate (bpm)	8	Minute Volume (l)	20	Inlet Pressure (psig)	40
		Stroke Volume (l)	2.5	Peak Inspired Flow (lpm)	200	Regulator Mode	Dilution

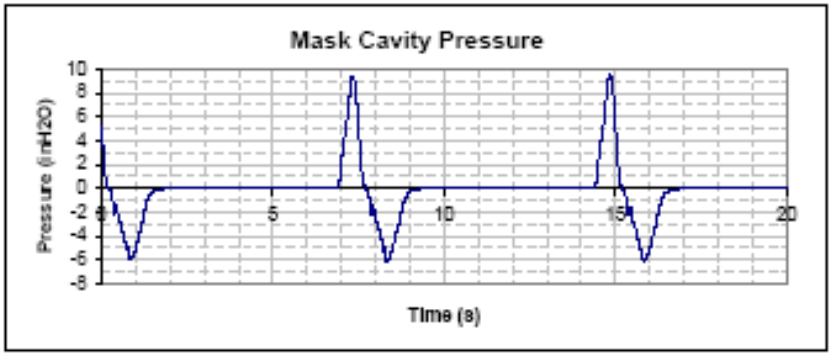






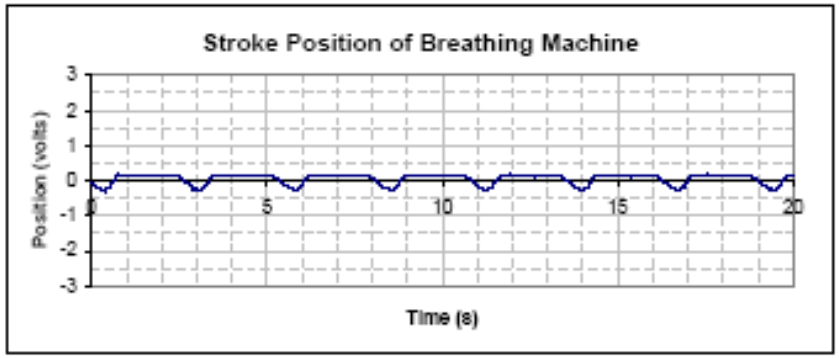


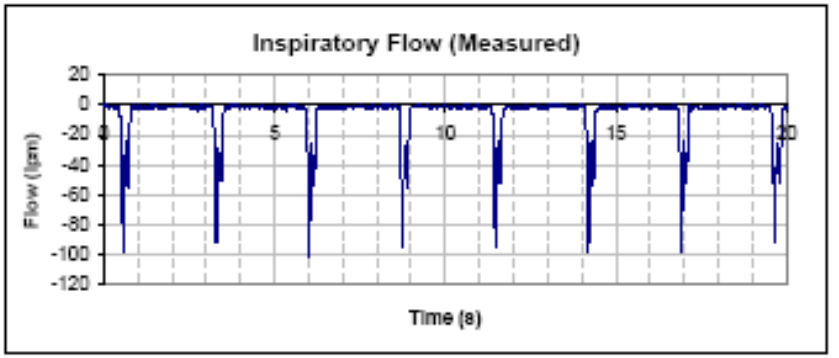


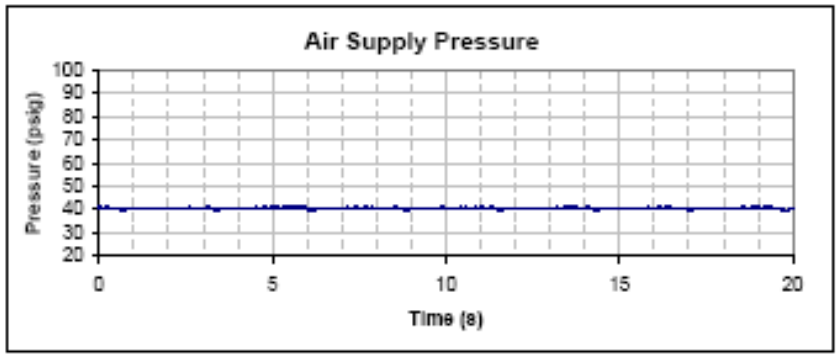


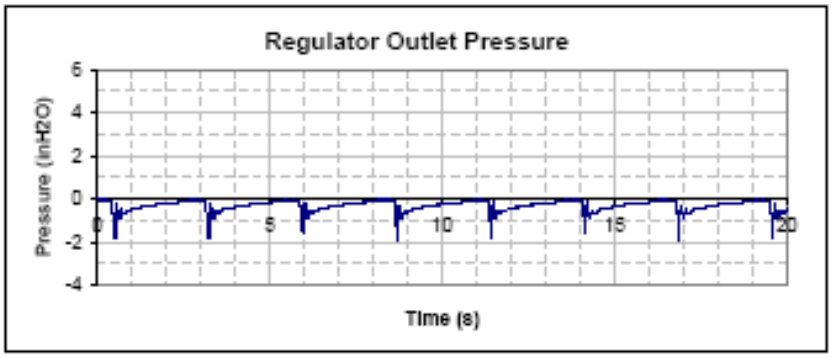
CF188 Oxygen System Compatability Test - NACES Configuration

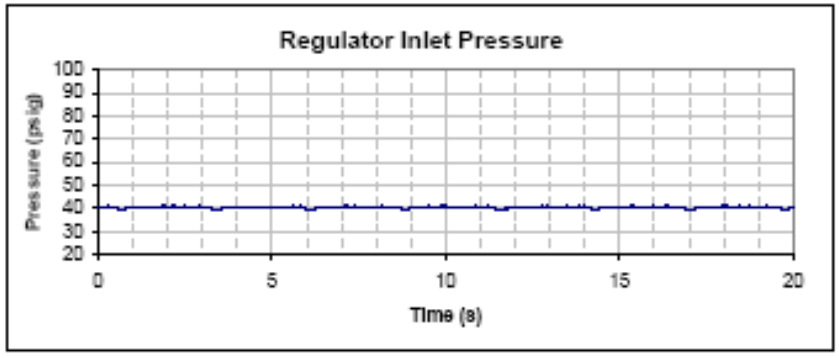
Group:	5 - Multi Extremes	Settings				Altitude	7.5
Test #:	57	Breathing Rate (bpm)	22	Minute Volume (l)	5	Inlet Pressure (psig)	40
		Stroke Volume (l)	0.23	Peak Inspired Flow (lpm)	50	Regulator Mode	Dilution

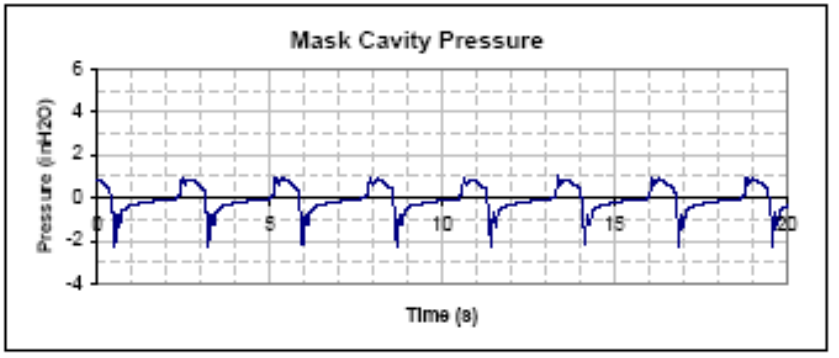






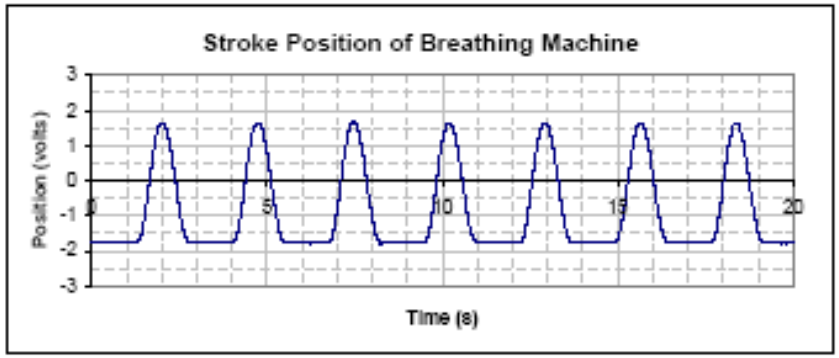


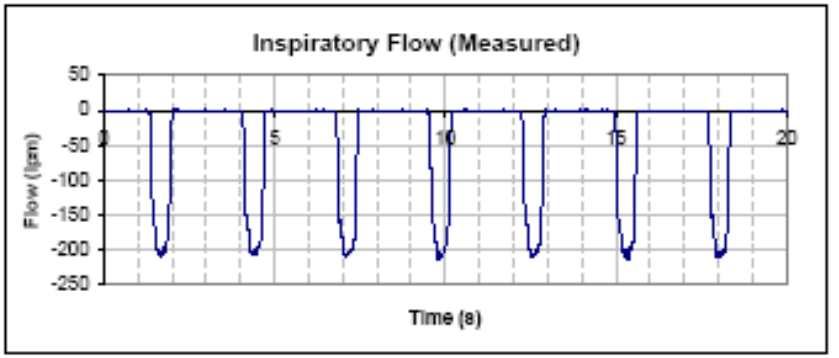


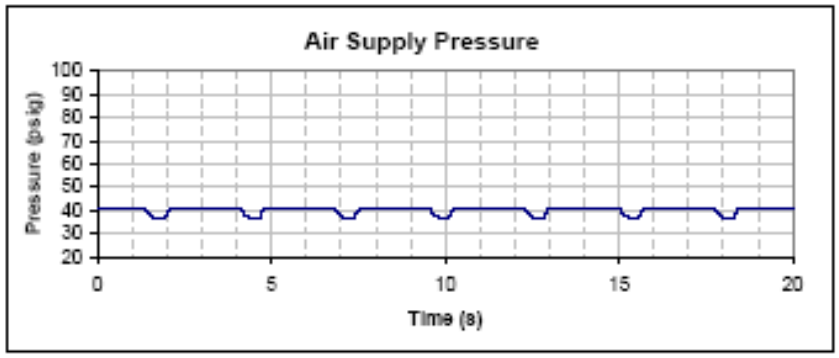


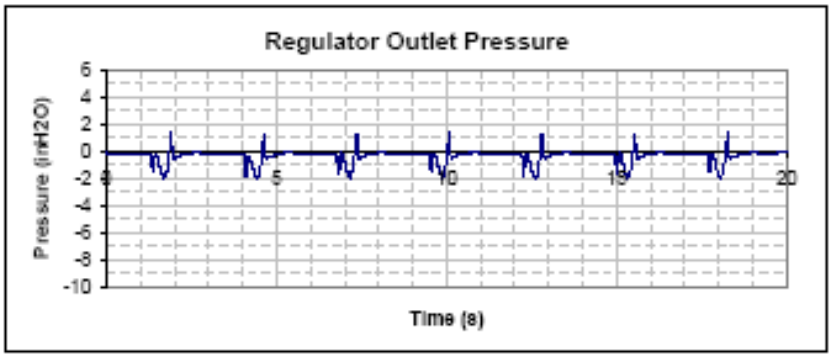
CF188 Oxygen System Compatability Test - NACES Configuration

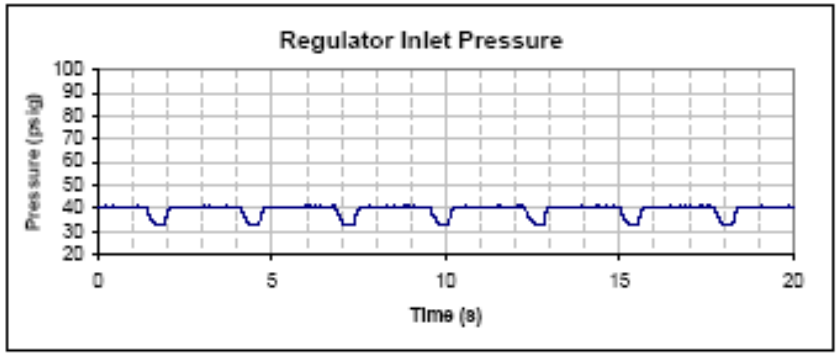
Group:	5 - Multi Extremes	Settings				Altitude	7.5
Test #:	58	Breathing Rate (bpm)	22	Minute Volume (l)	40	Inlet Pressure (psig)	40
		Stroke Volume (l)	1.82	Peak Inspired Flow (lpm)	250	Regulator Mode	Dilution

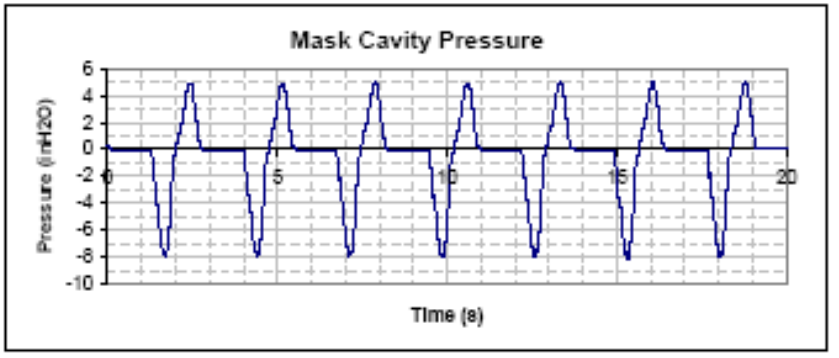










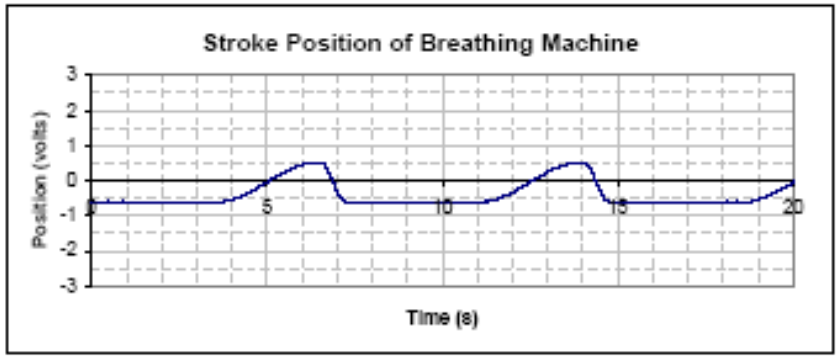


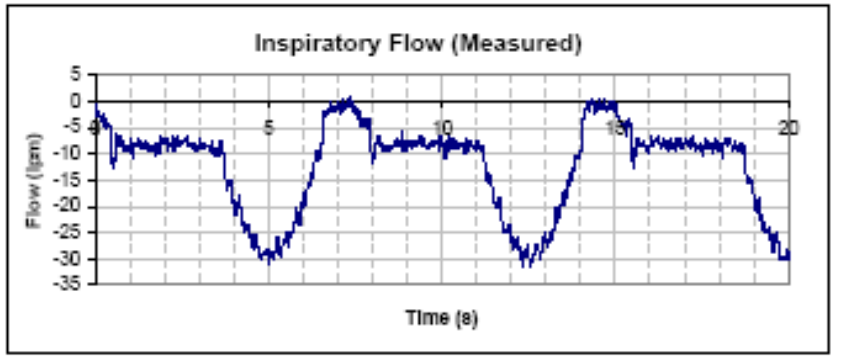
CF188 Oxygen System Compatability Test - NACES Configuration

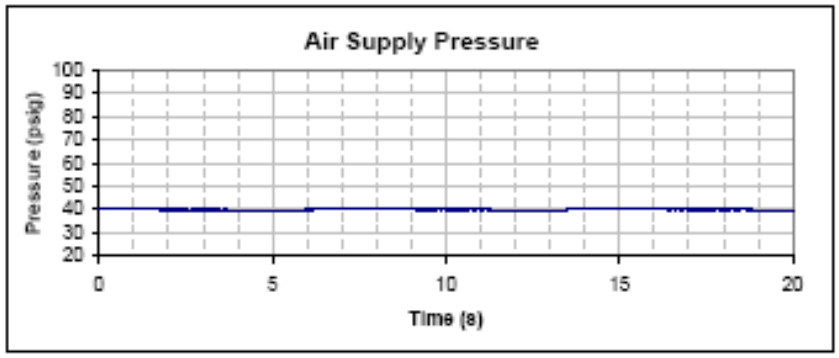
Group: 5 - Multi Extremes
Test #: 59

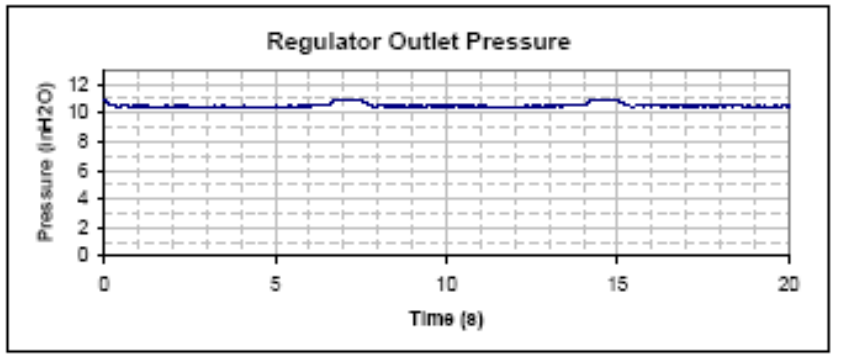
Settings

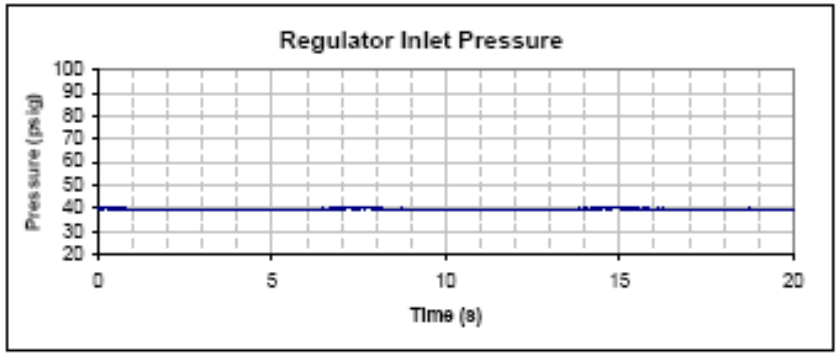
Breathing Rate (bpm)	8	Minute Volume (l)	5	Altitude	45
Stroke Volume (l)	0.625	Peak Inspired Flow (lpm)	20	Inlet Pressure (psig)	40
				Regulator Mode	Dilution

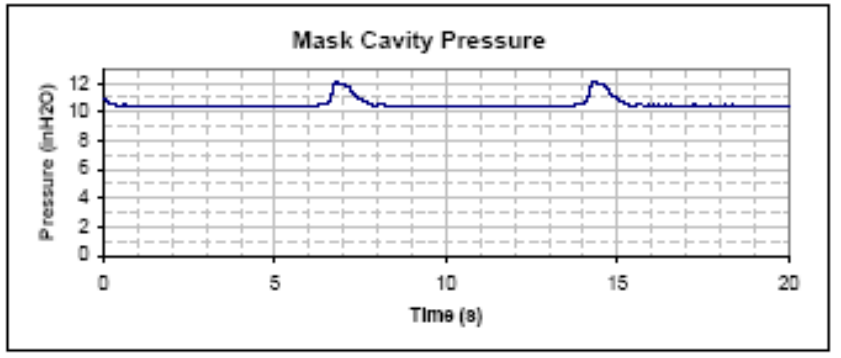






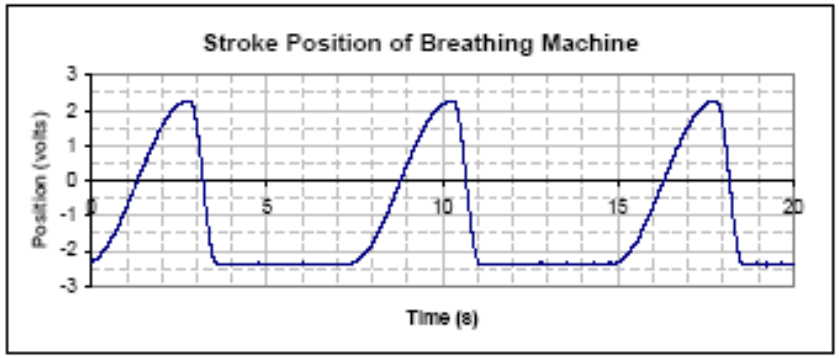


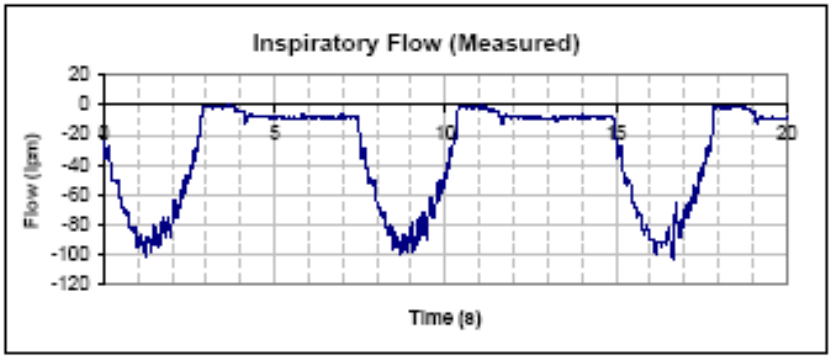


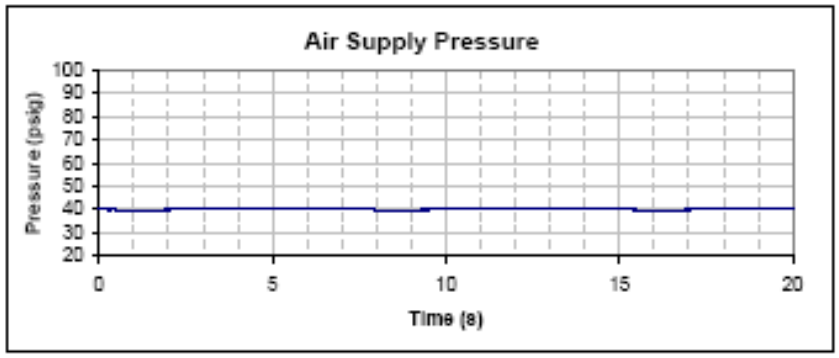


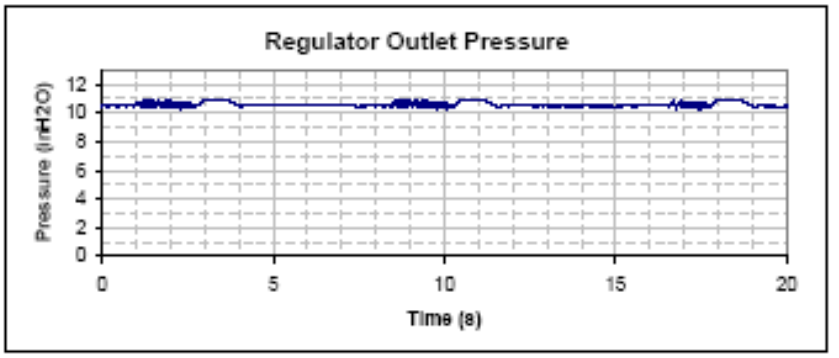
CF188 Oxygen System Compatability Test - NACES Configuration

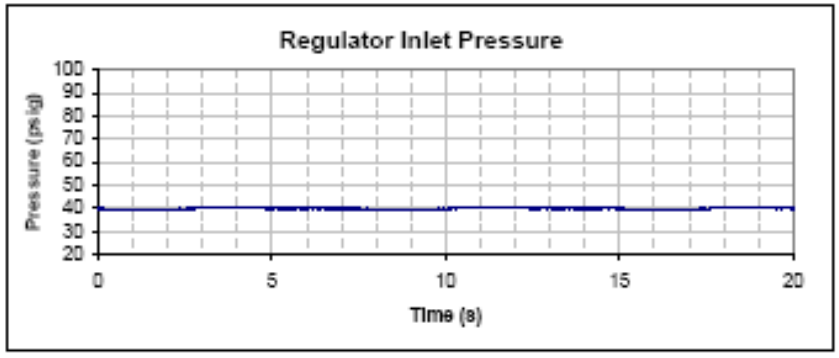
Group:	5 - Multi Extremes	Settings				Altitude	45
Test #:	60	Breathing Rate (bpm)	8	Minute Volume (l)	20	Inlet Pressure (psig)	40
		Stroke Volume (l)	2.5	Peak Inspired Flow (lpm)	80	Regulator Mode	Dilution

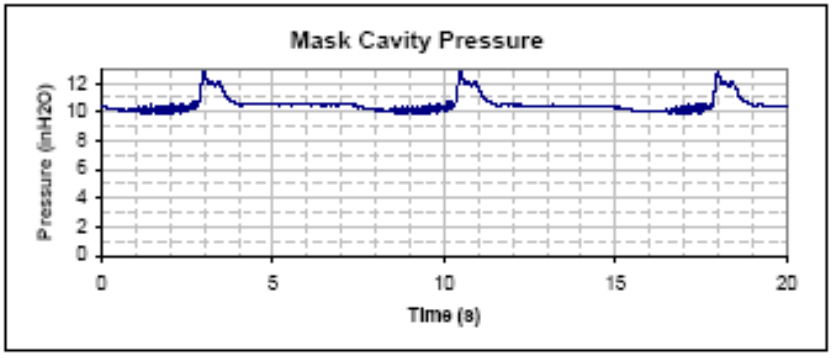






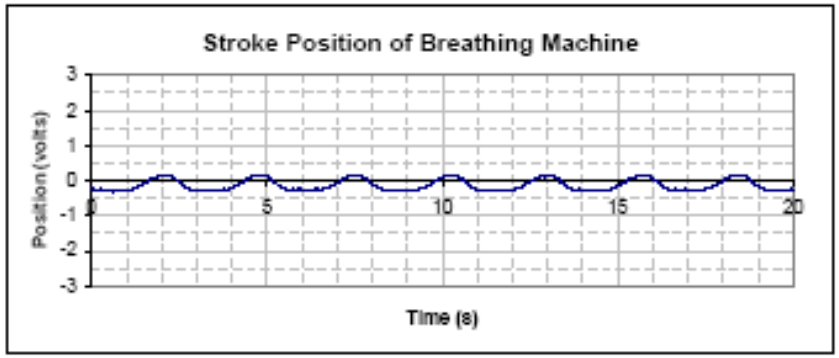


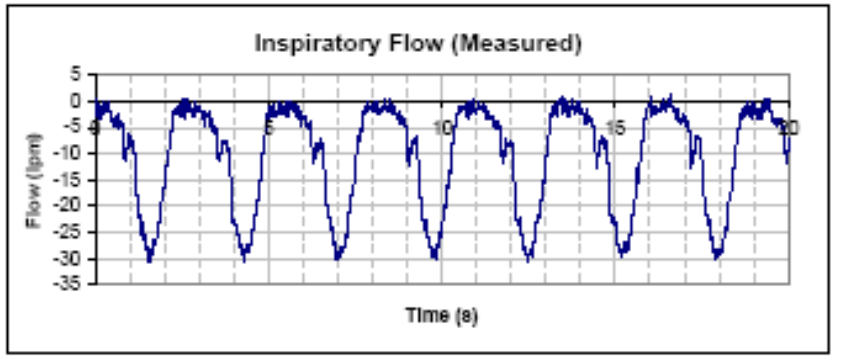


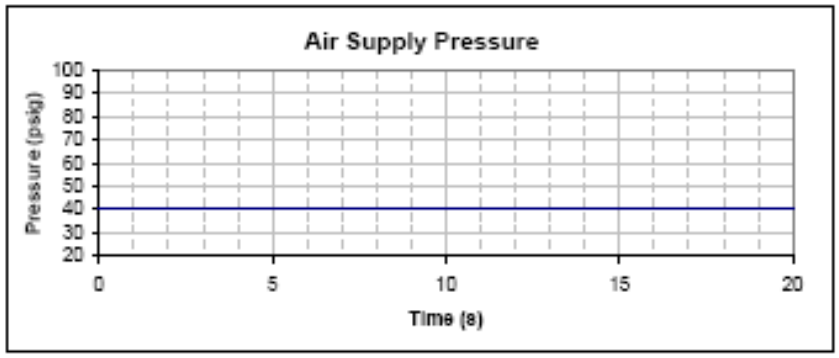


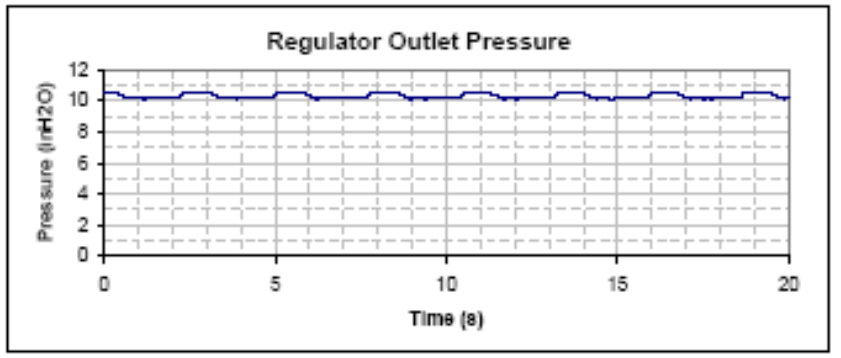
CF188 Oxygen System Compatability Test - NACES Configuration

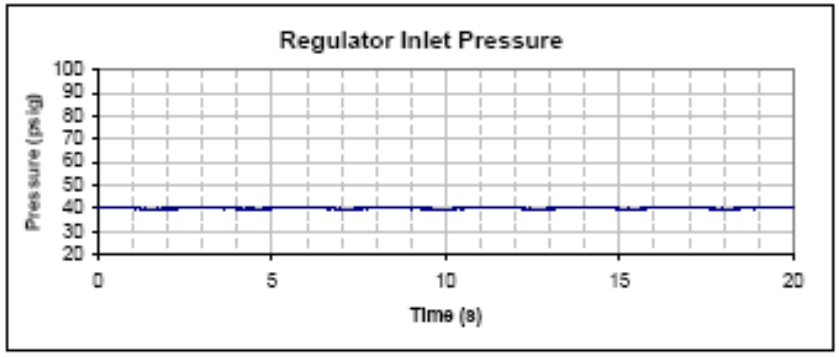
Group:	5 - Multi Extremes	Settings				Altitude	45
Test #:	61	Breathing Rate (bpm)	22	Minute Volume (l)	5	Inlet Pressure (psig)	40
		Stroke Volume (l)	0.23	Peak Inspired Flow (lpm)	20	Regulator Mode	Dillution

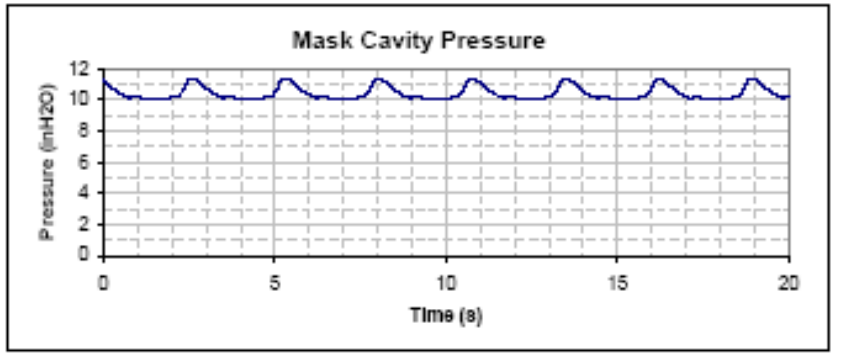










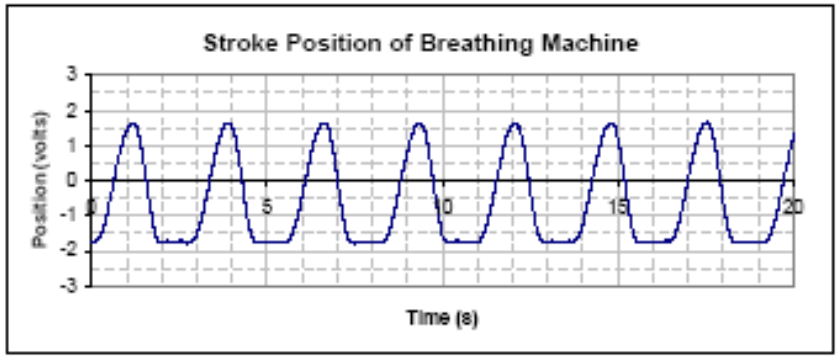


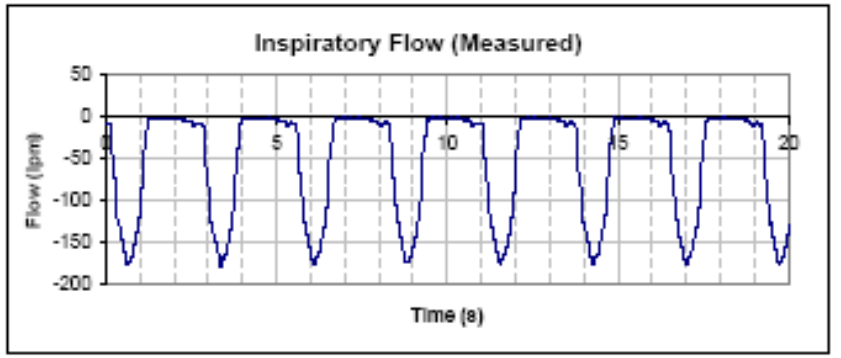
CF188 Oxygen System Compatability Test - NACES Configuration

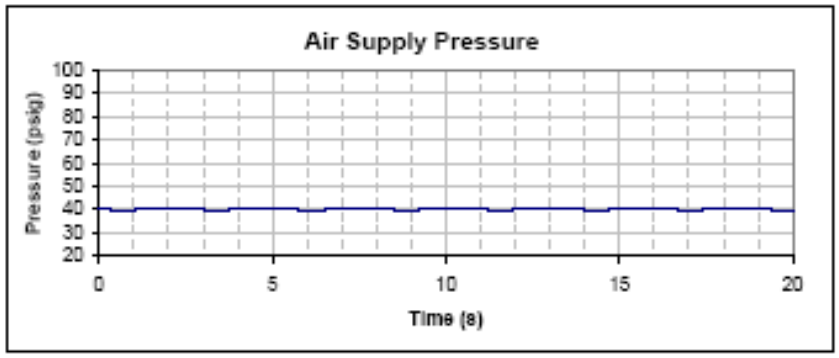
Group: 5 - Multi Extremes
Test #: 62

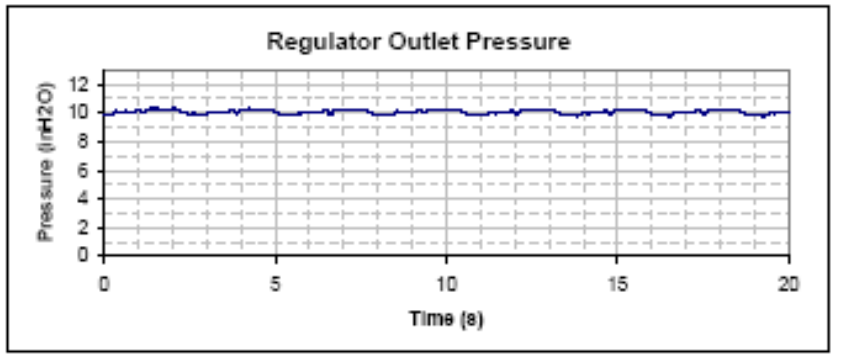
Settings

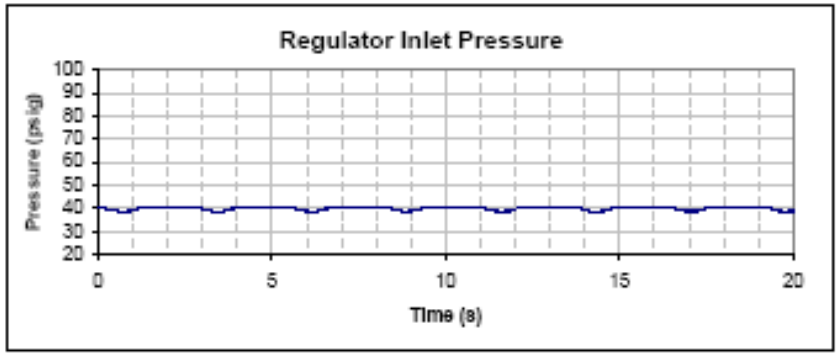
Breathing Rate (bpm)	22	Minute Volume (l)	40	Altitude	45
Stroke Volume (l)	1.82	Peak Inspired Flow (lpm)	160	Inlet Pressure (psig)	40
				Regulator Mode	Dilution

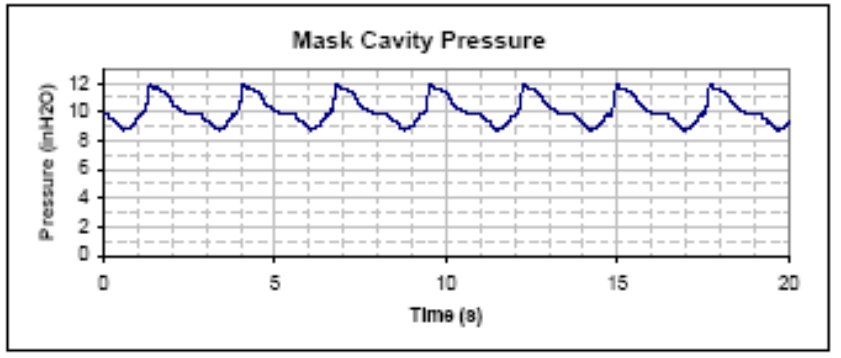






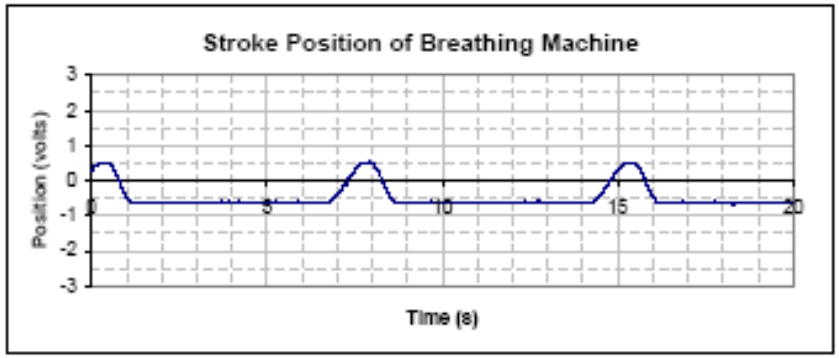


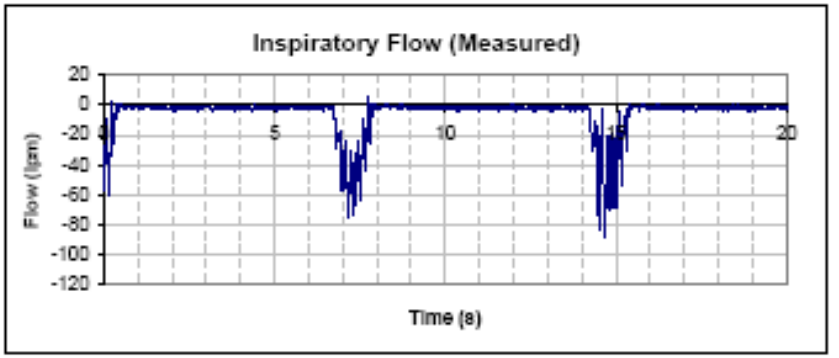


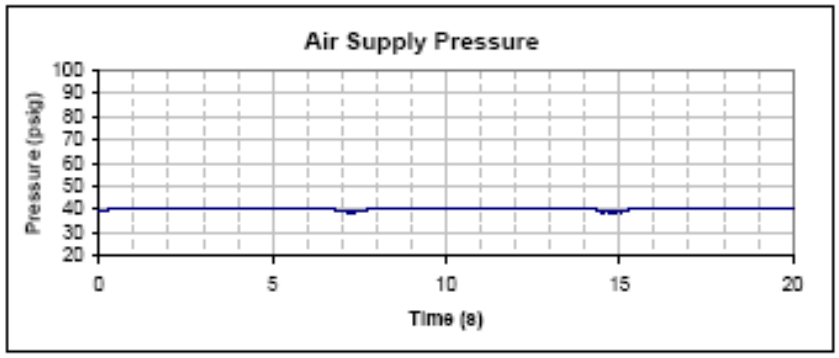


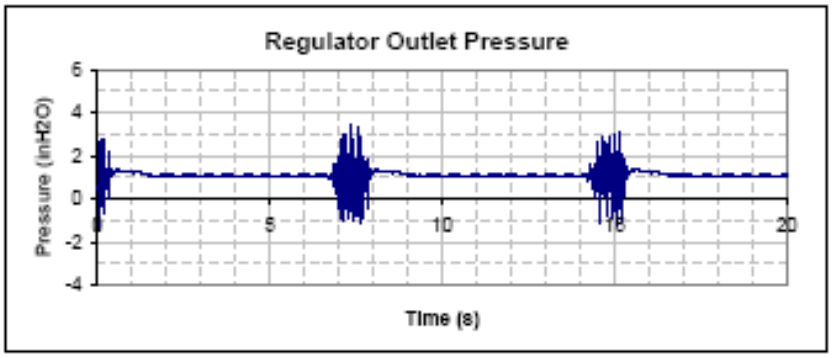
CF188 Oxygen System Compatability Test - NACES Configuration

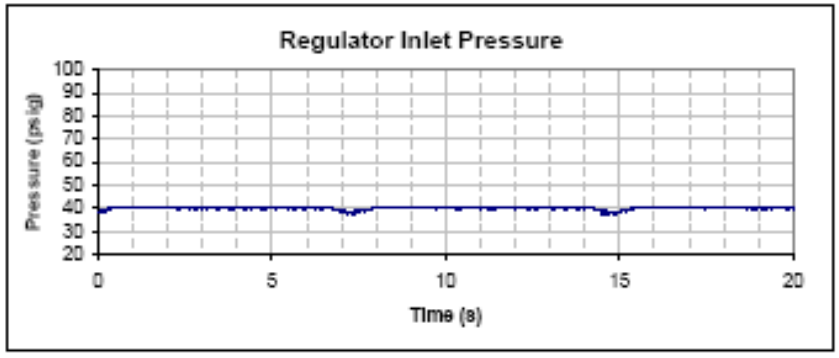
Group:	5 - Multi Extremes	Settings				Altitude	7.5
Test #:	63	Breathing Rate (bpm)	8	Minute Volume (l)	5	Inlet Pressure (psig)	40
		Stroke Volume (l)	0.625	Peak Inspired Flow (lpm)	50	Regulator Mode	100%

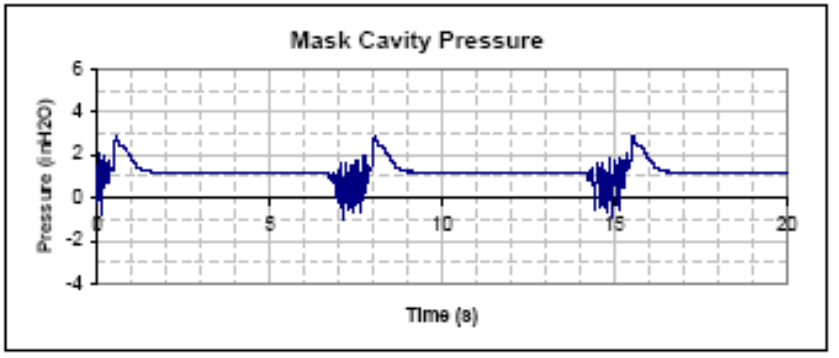










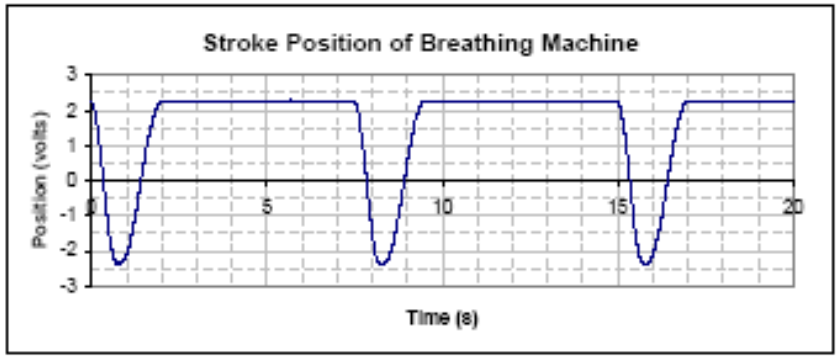


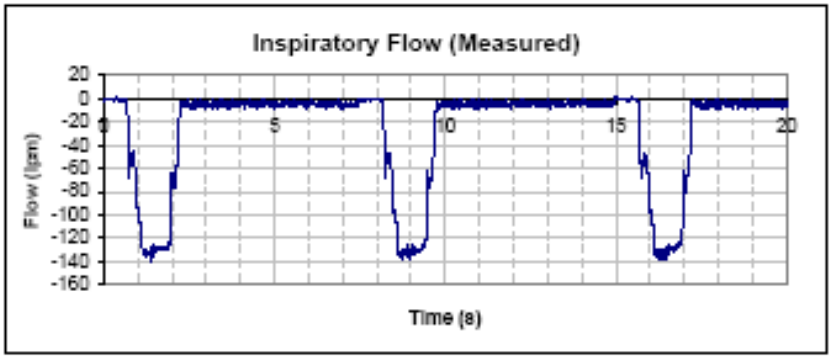
CF188 Oxygen System Compatability Test - NACES Configuration

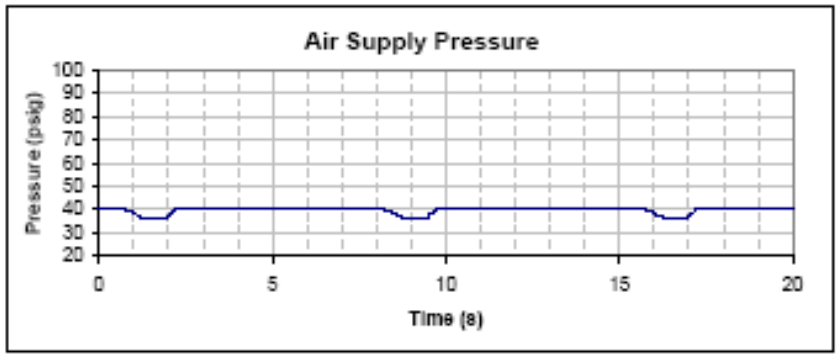
Group: 5 - Multi Extremes
Test #: 64

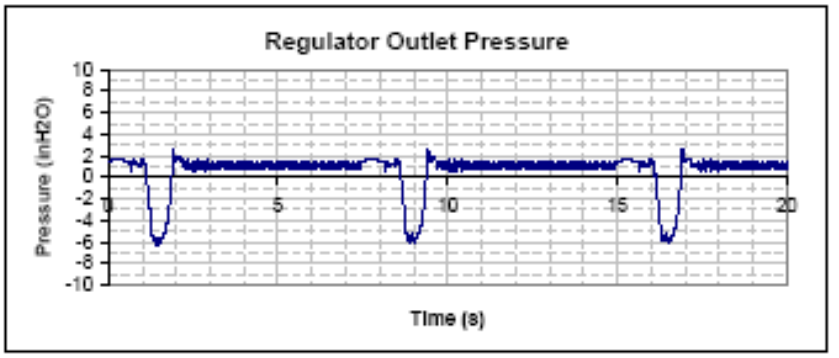
Settings

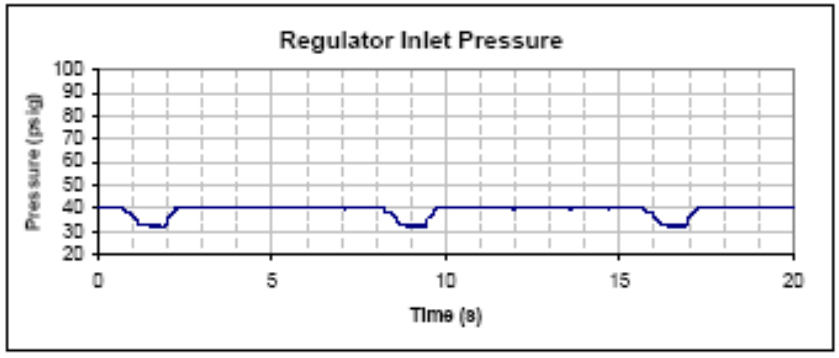
Breathing Rate (bpm)	8	Minute Volume (l)	20	Altitude	7.5
Stroke Volume (l)	2.5	Peak Inspired Flow (lpm)	200	Inlet Pressure (psig)	40
				Regulator Mode	100%

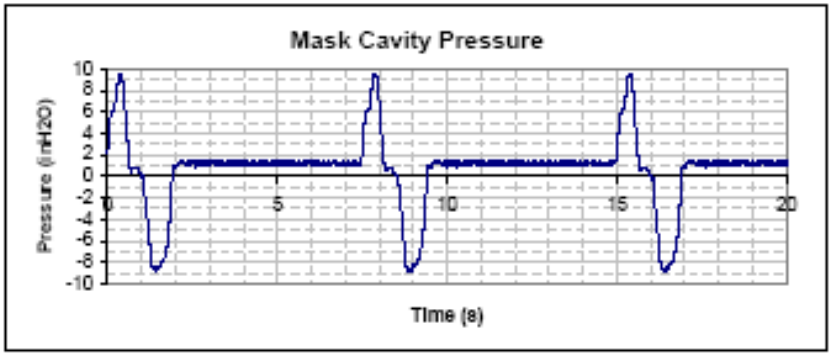






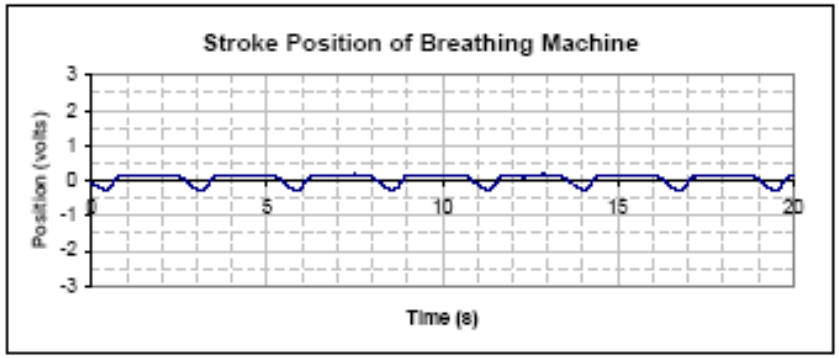


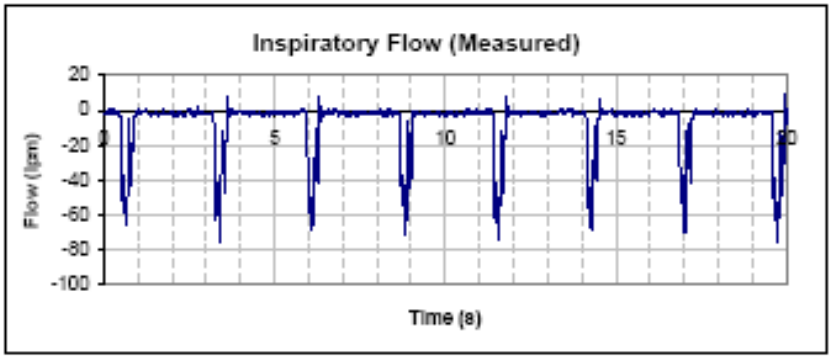


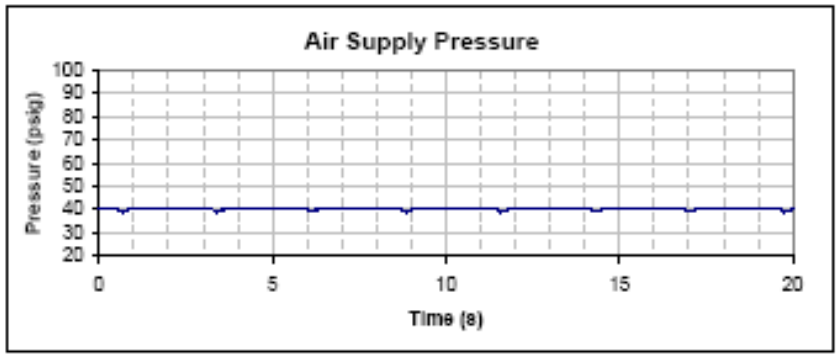


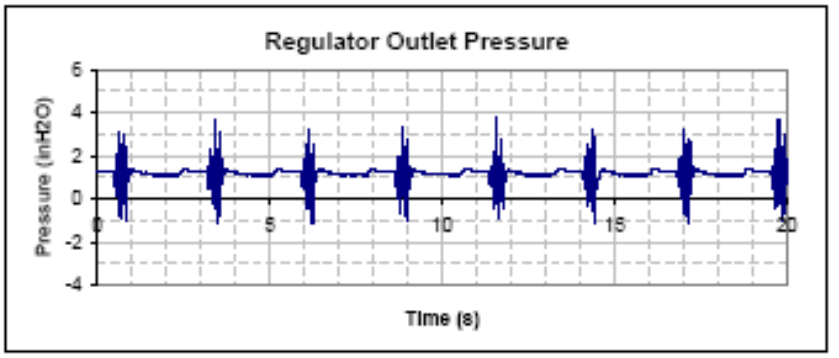
CF188 Oxygen System Compatability Test - NACES Configuration

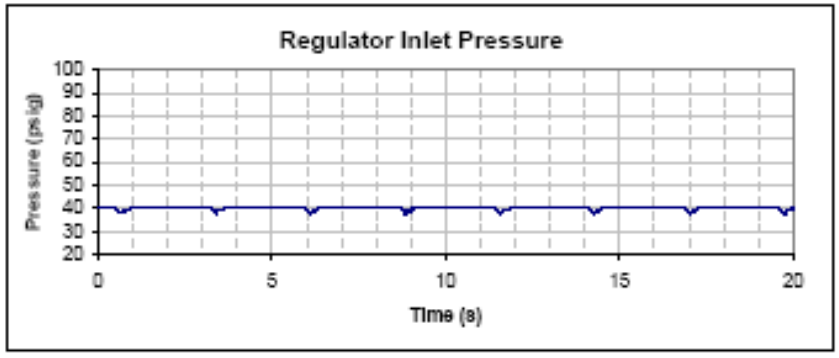
Group:	5 - Multi Extremes	Settings				Altitude	7.5
Test #:	65	Breathing Rate (bpm)	22	Minute Volume (l)	5	Inlet Pressure (psig)	40
		Stroke Volume (l)	0.23	Peak Inspired Flow (lpm)	50	Regulator Mode	100%

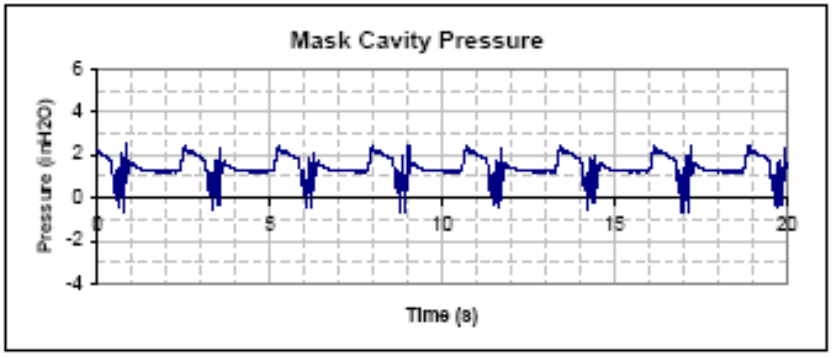










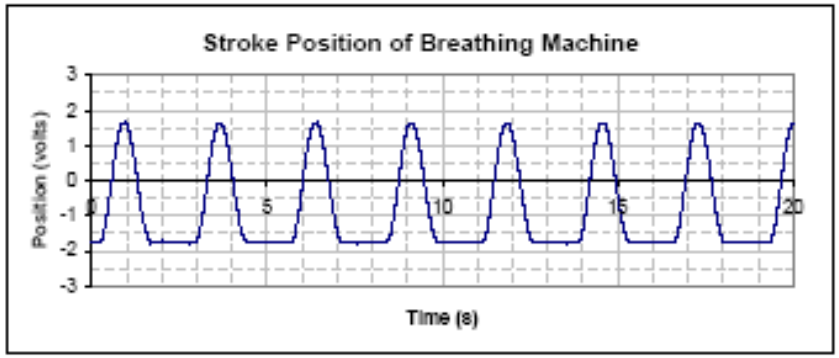


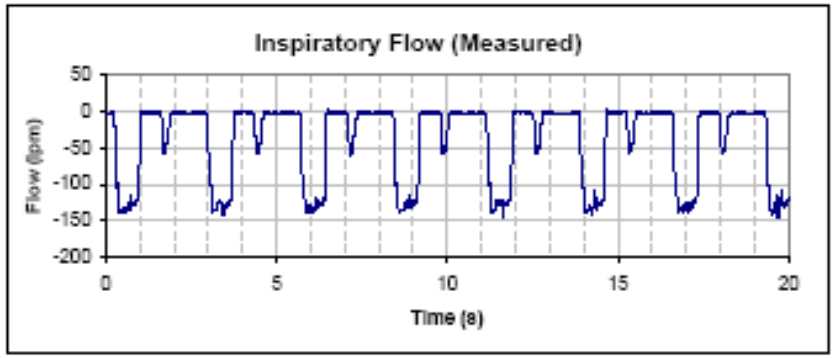
CF188 Oxygen System Compatability Test - NACES Configuration

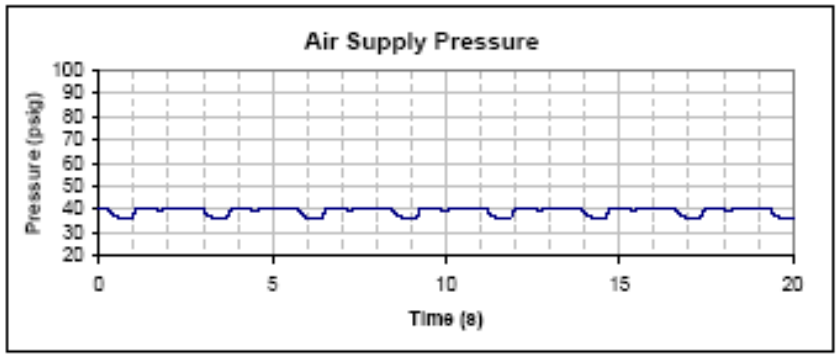
Group: 5 - Multi Extremes
Test #: 66

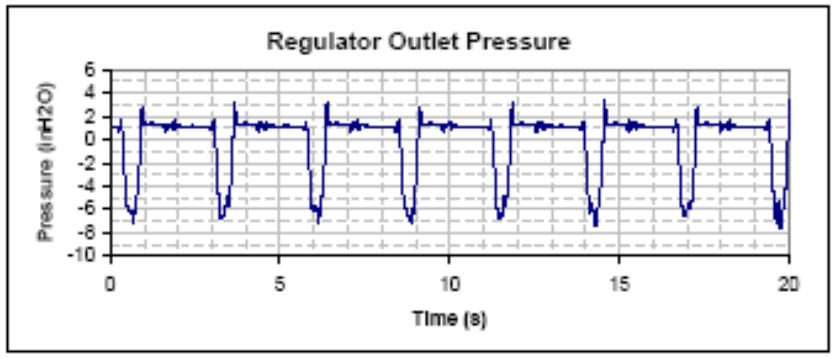
Settings

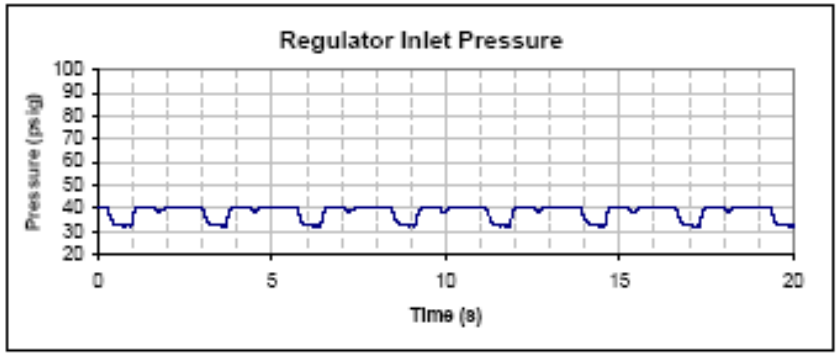
Breathing Rate (bpm)	22	Minute Volume (l)	40	Altitude	7.5
Stroke Volume (l)	1.82	Peak Inspired Flow (lpm)	250	Inlet Pressure (psig)	40
				Regulator Mode	100%

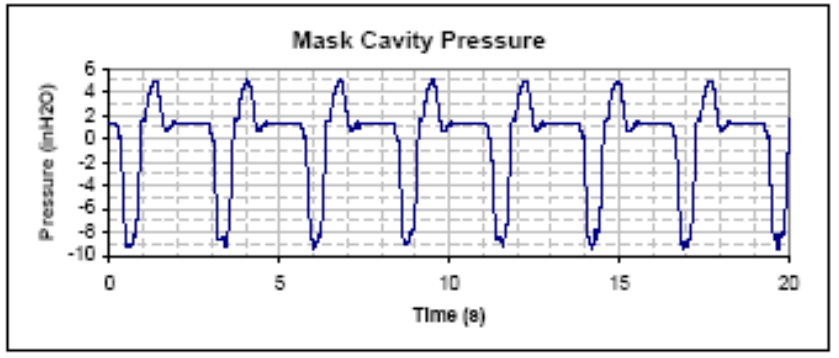










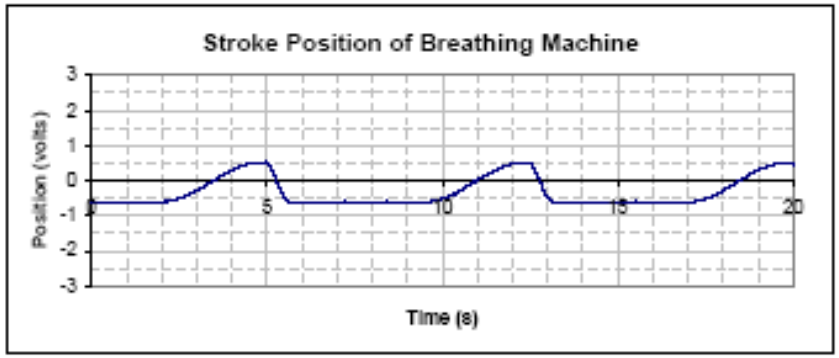


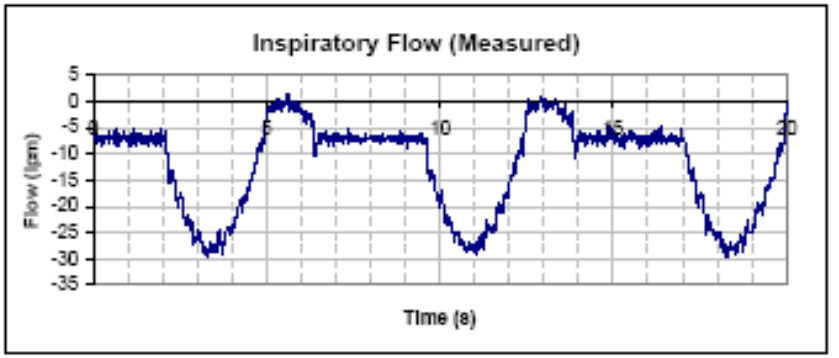
CF188 Oxygen System Compatability Test - NACES Configuration

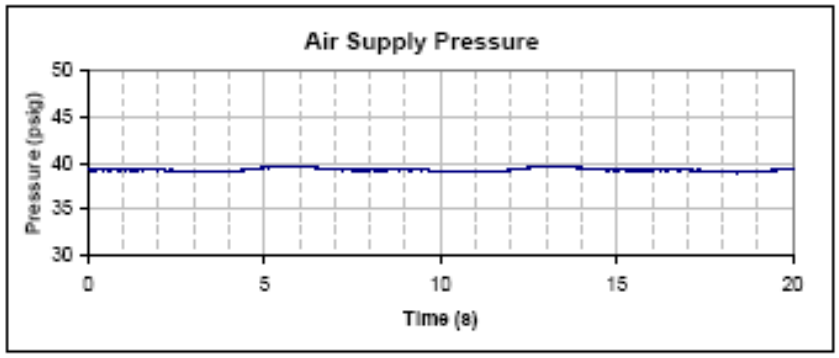
Group: 5 - Multi Extremes
Test #: 67

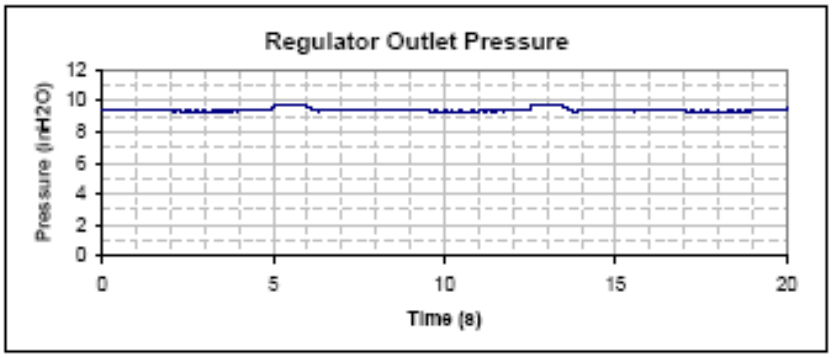
Settings

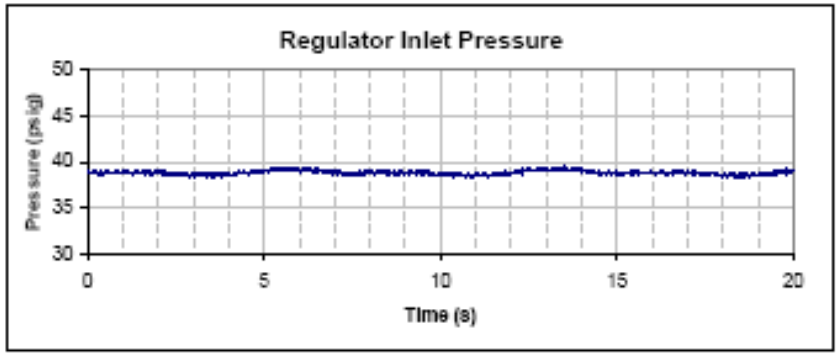
Breathing Rate (bpm)	8	Minute Volume (l)	5	Altitude	45
Stroke Volume (l)	0.625	Peak Inspired Flow (lpm)	20	Inlet Pressure (psig)	40
				Regulator Mode	100%

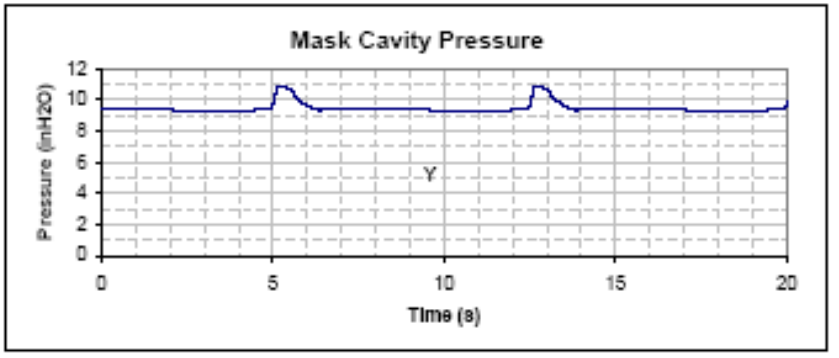






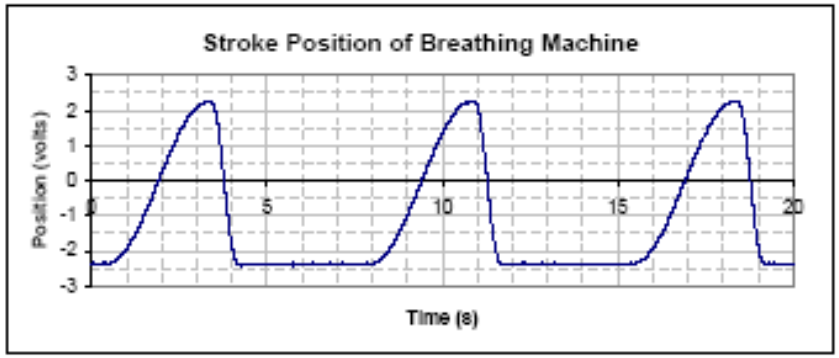


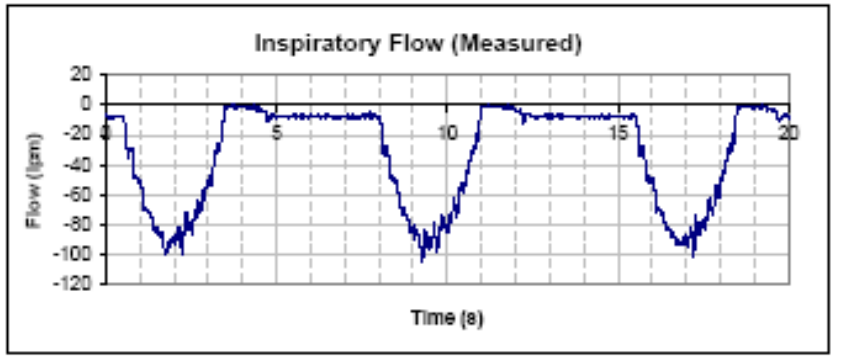


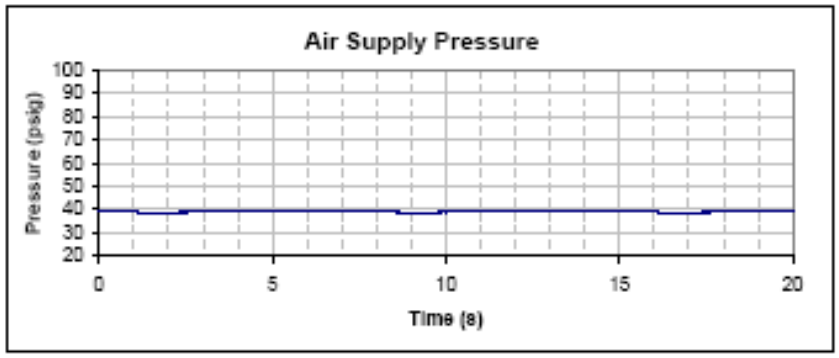


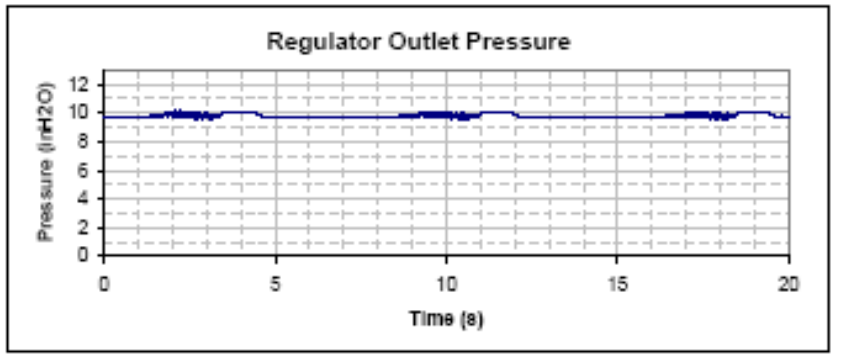
CF188 Oxygen System Compatability Test - NACES Configuration

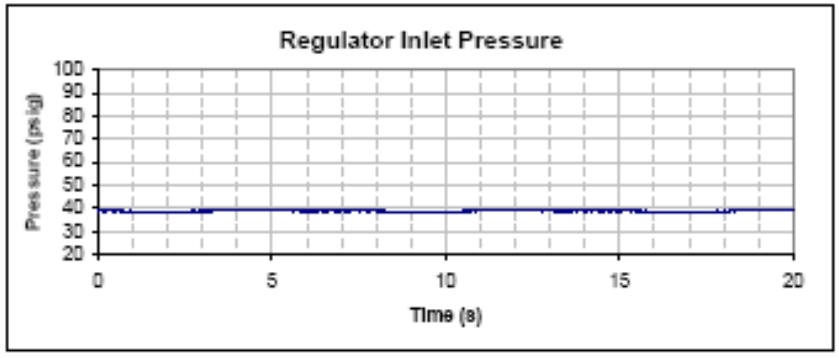
Group:	5 - Multi Extremes	Settings				Altitude	45
Test #:	68	Breathing Rate (bpm)	8	Minute Volume (l)	20	Inlet Pressure (psig)	40
		Stroke Volume (l)	2.5	Peak Inspired Flow (lpm)	80	Regulator Mode	100%

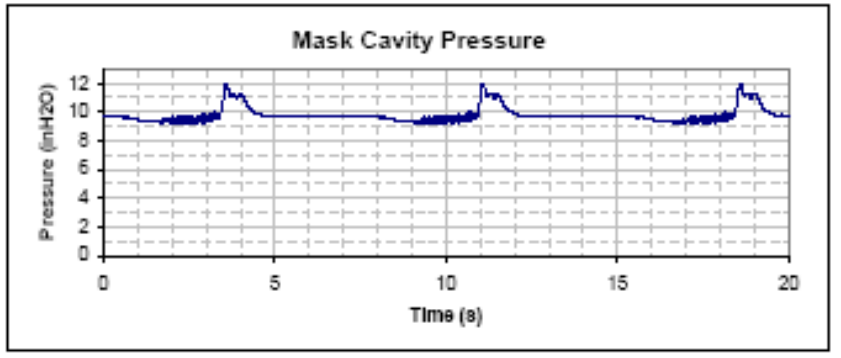






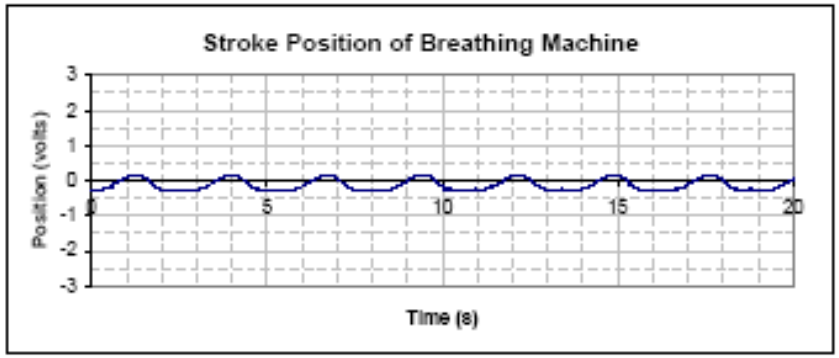


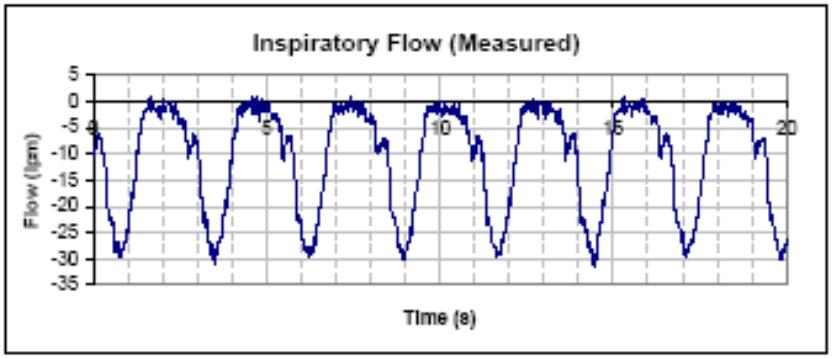


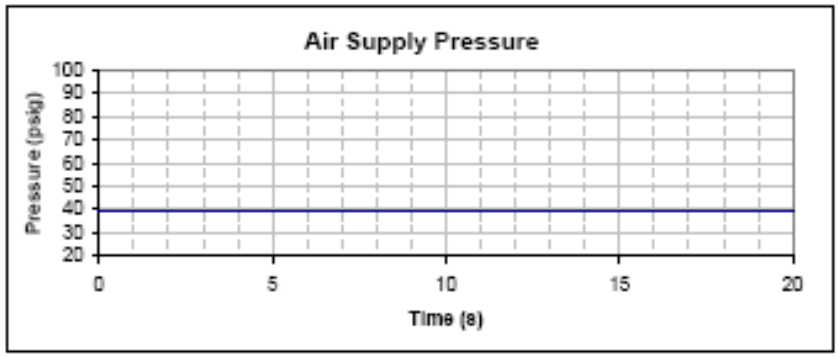


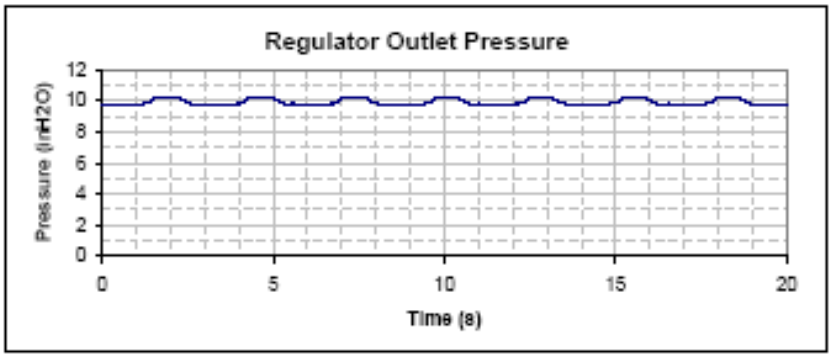
CF188 Oxygen System Compatability Test - NACES Configuration

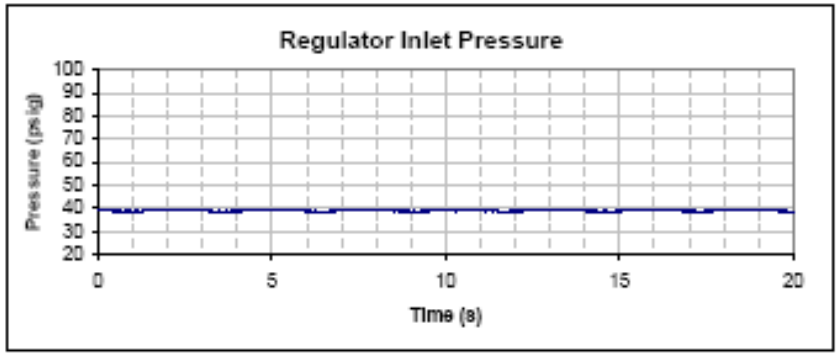
Group:	5 - Multi Extremes	Settings				Altitude	45
Test #:	69	Breathing Rate (bpm)	22	Minute Volume (l)	5	Inlet Pressure (psig)	40
		Stroke Volume (l)	0.23	Peak Inspired Flow (lpm)	20	Regulator Mode	100%

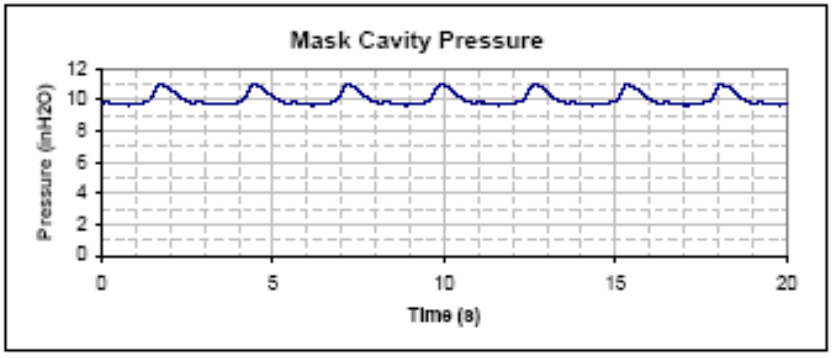






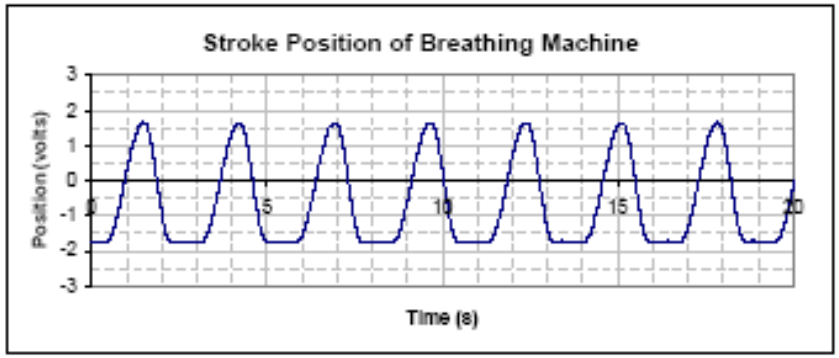


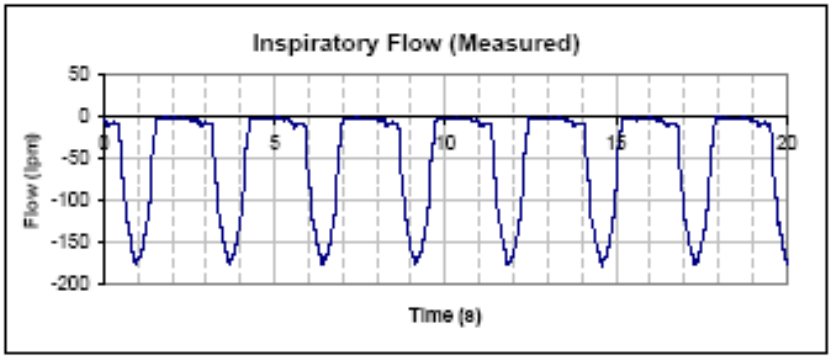


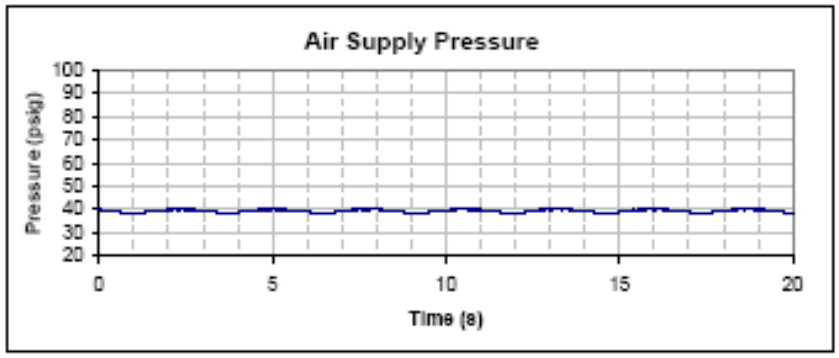


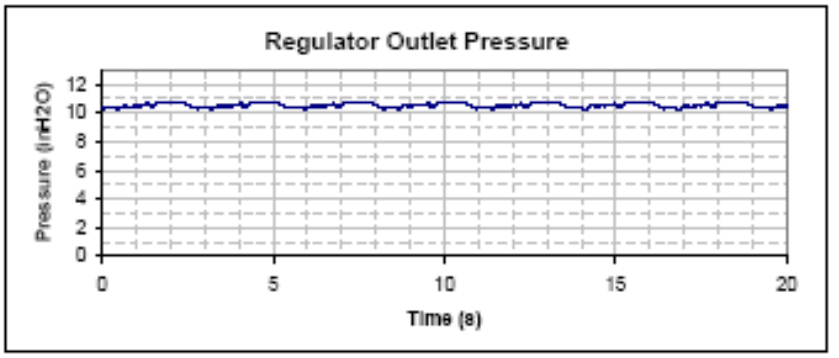
CF188 Oxygen System Compatability Test - NACES Configuration

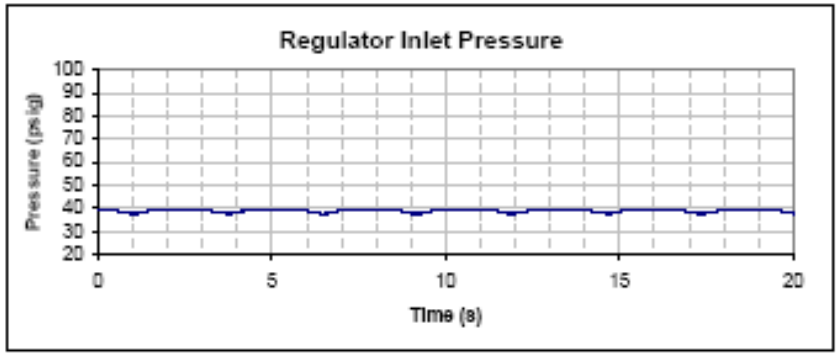
Group:	5 - Multi Extremes	Settings				Altitude	45
Test #:	70	Breathing Rate (bpm)	22	Minute Volume (l)	40	Inlet Pressure (psig)	40
		Stroke Volume (l)	1.82	Peak Inspired Flow (lpm)	160	Regulator Mode	100%

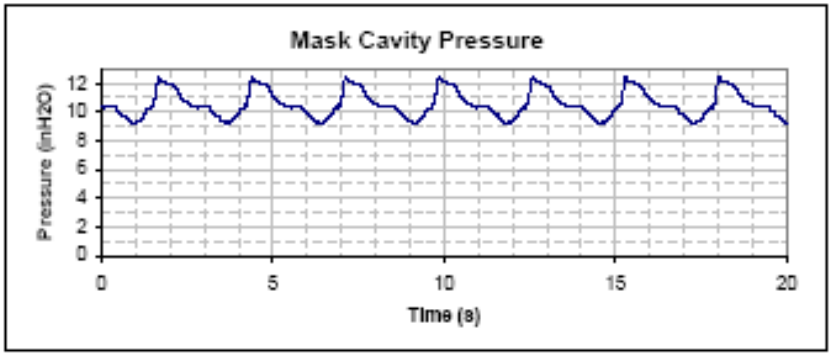






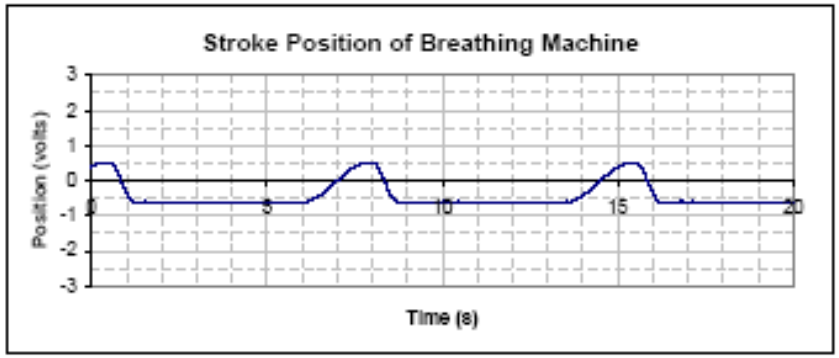


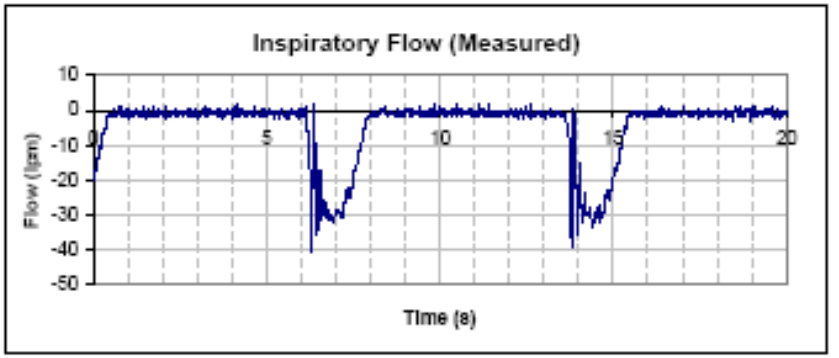


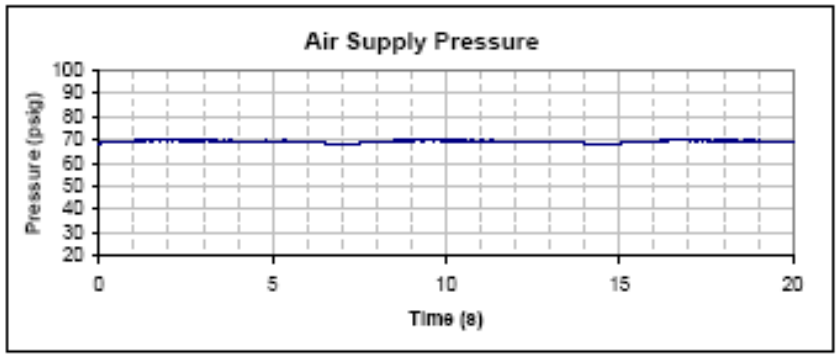


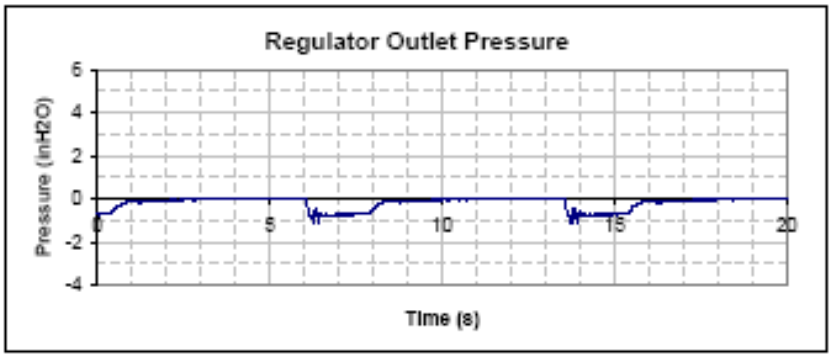
CF188 Oxygen System Compatability Test - NACES Configuration

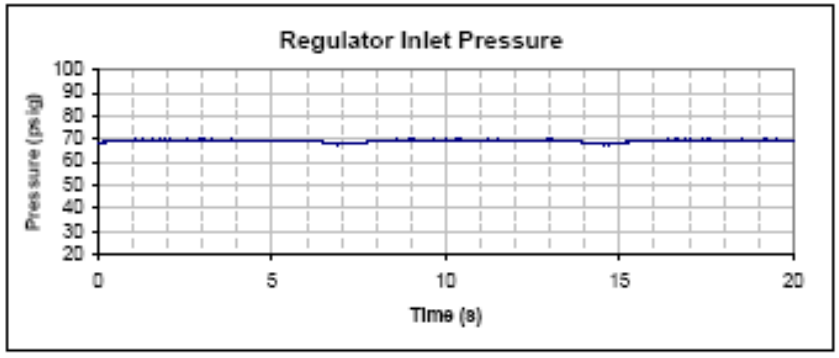
Group:	6 - Varied Breathing Rate & Flows	Settings				Altitude	GL
		Breathing Rate (bpm)	8	Minute Volume (l)	5	Inlet Pressure (psig)	70
Test #:	71	Stroke Volume (l)	0.625	Peak Inspired Flow (lpm)	30	Regulator Mode	Dilution

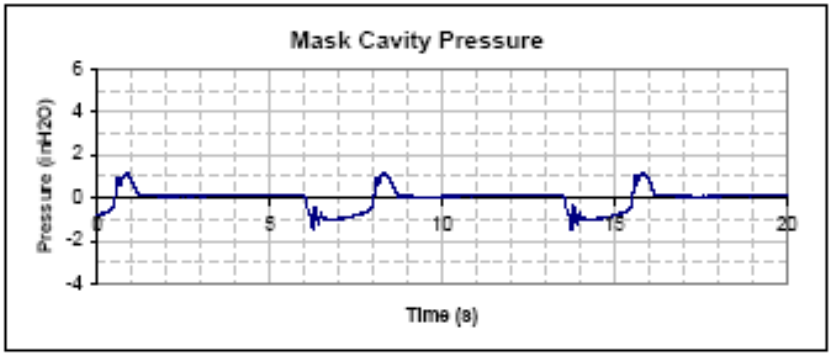






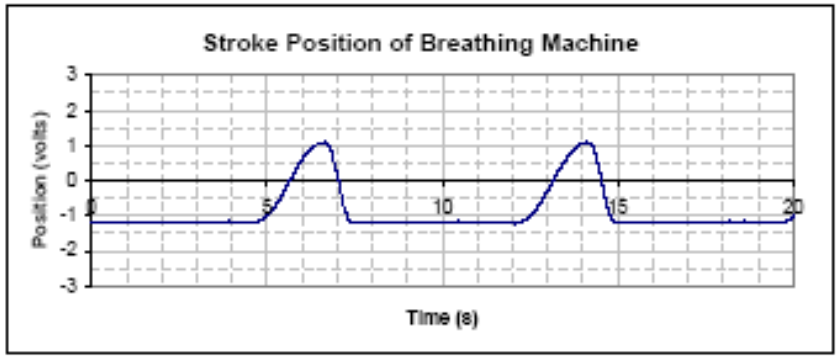


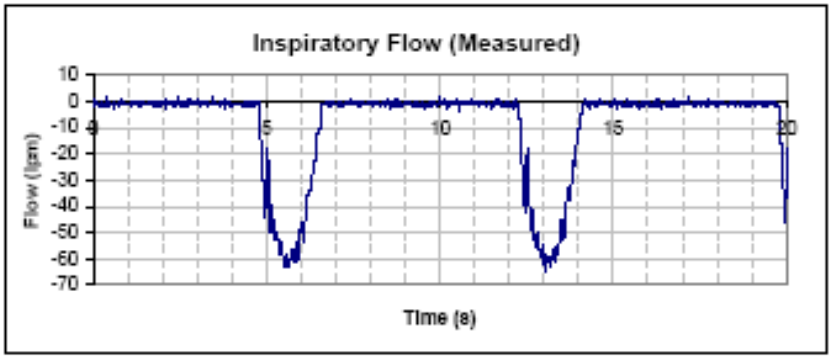


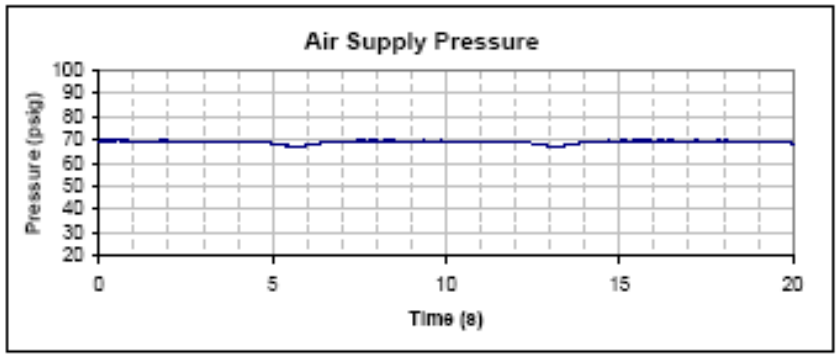


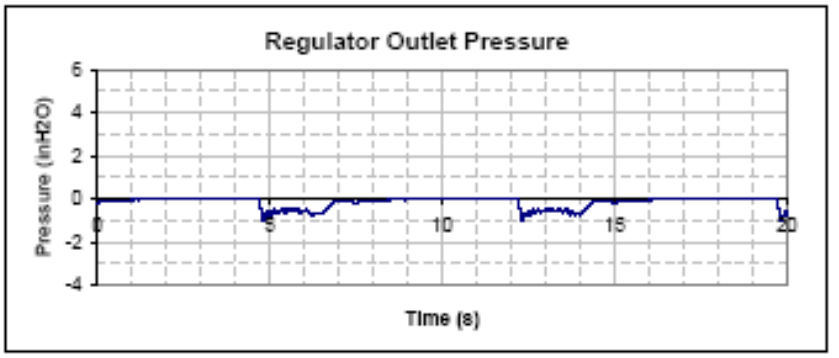
CF188 Oxygen System Compatability Test - NACES Configuration

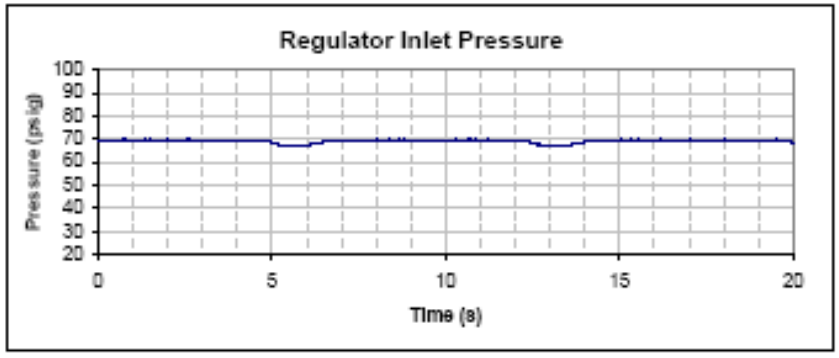
Group:	6 - Varied Breathing Rate & Flows	Settings				Altitude	GL
		Breathing Rate (bpm)	8	Minute Volume (l)	10	Inlet Pressure (psig)	70
Test #:	72	Stroke Volume (l)	1.25	Peak Inspired Flow (lpm)	60	Regulator Mode	Dilution

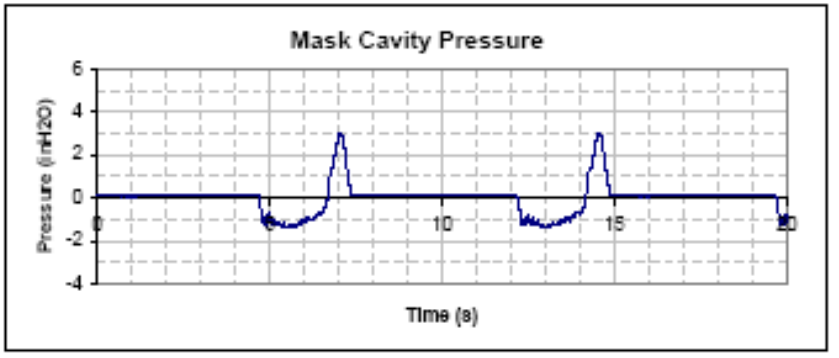






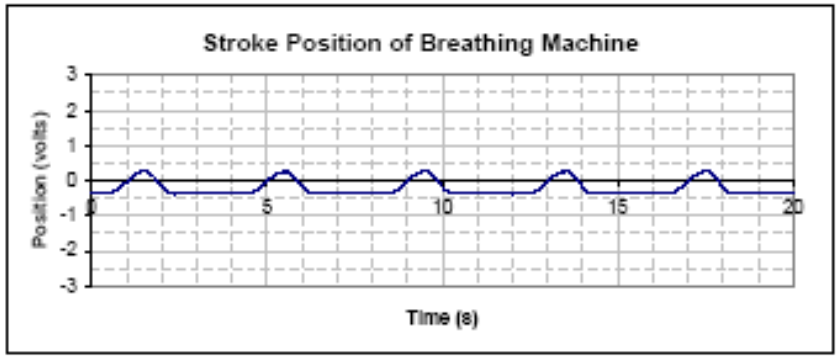


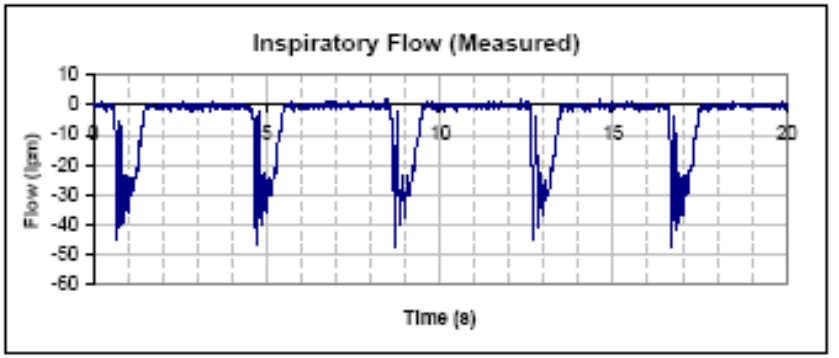


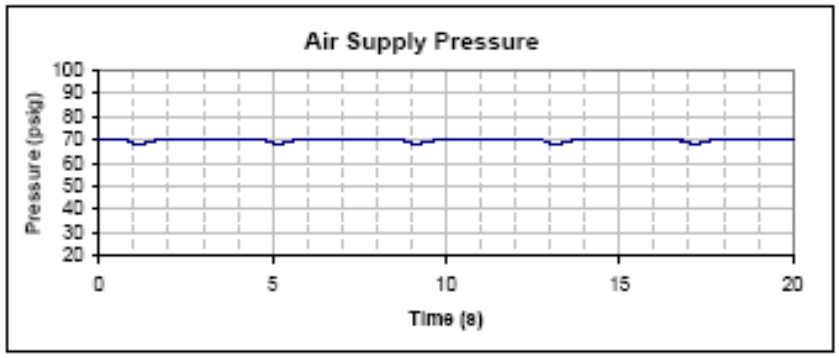


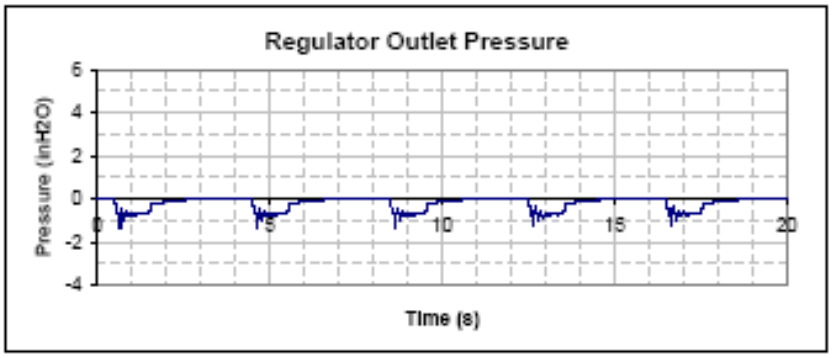
CF188 Oxygen System Compatability Test - NACES Configuration

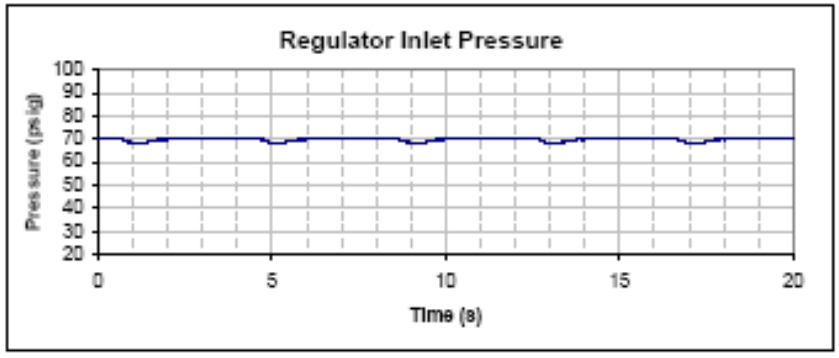
Group:	6 - Varied Breathing Rate & Flows	Settings				Altitude	GL
		Breathing Rate (bpm)	15	Minute Volume (l)	5	Inlet Pressure (psig)	70
Test #:	73	Stroke Volume (l)	0.33	Peak Inspired Flow (lpm)	30	Regulator Mode	Dilution

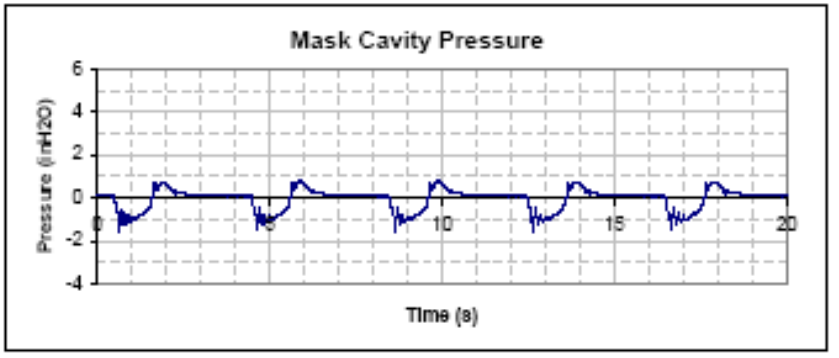






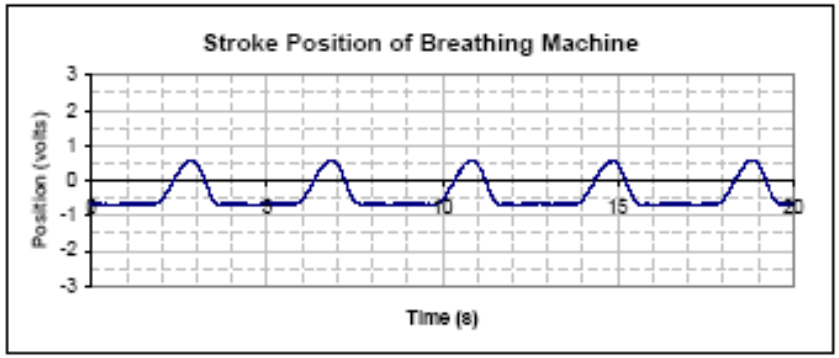


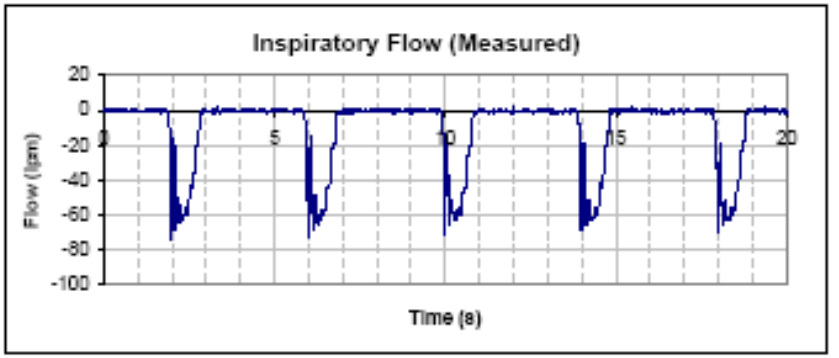


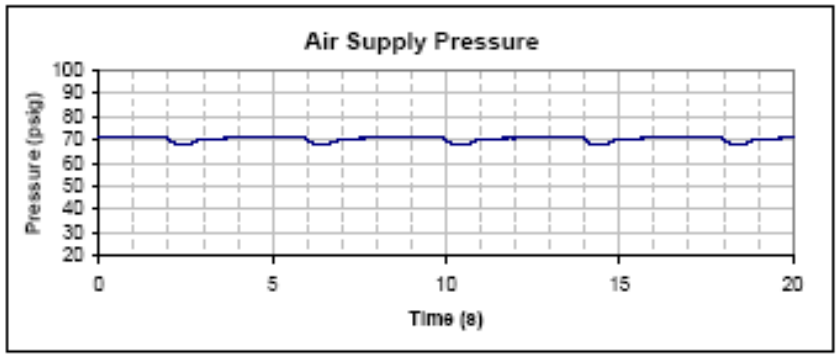


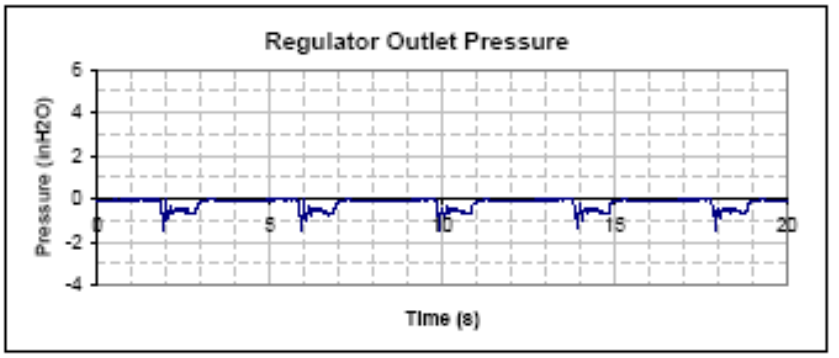
CF188 Oxygen System Compatability Test - NACES Configuration

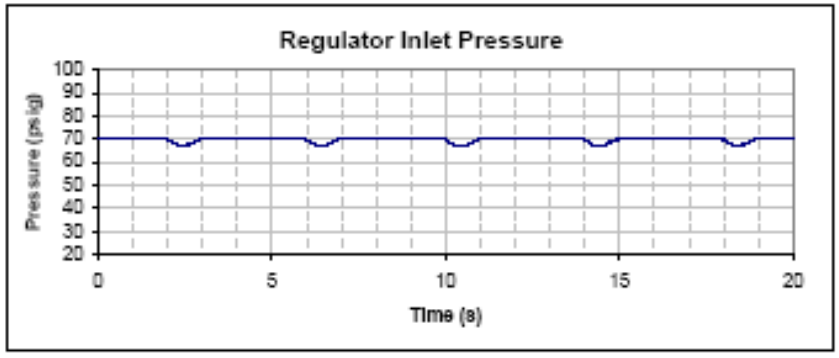
Group:	6 - Varied Breathing Rate & Flows	Settings				Altitude	GL
		Breathing Rate (bpm)	15	Minute Volume (l)	10	Inlet Pressure (psig)	70
Test #:	74	Stroke Volume (l)	0.67	Peak Inspired Flow (lpm)	60	Regulator Mode	Dilution

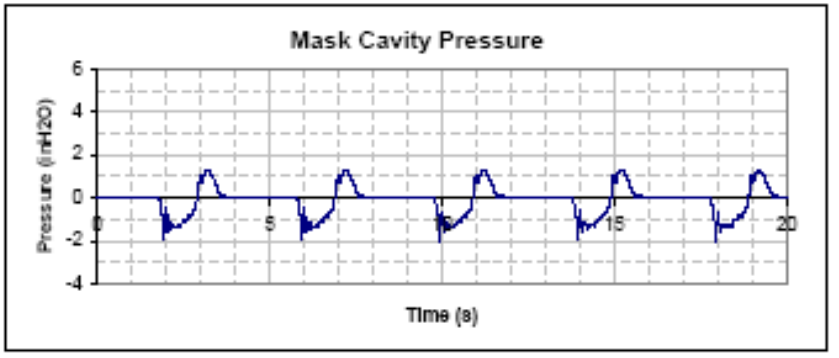






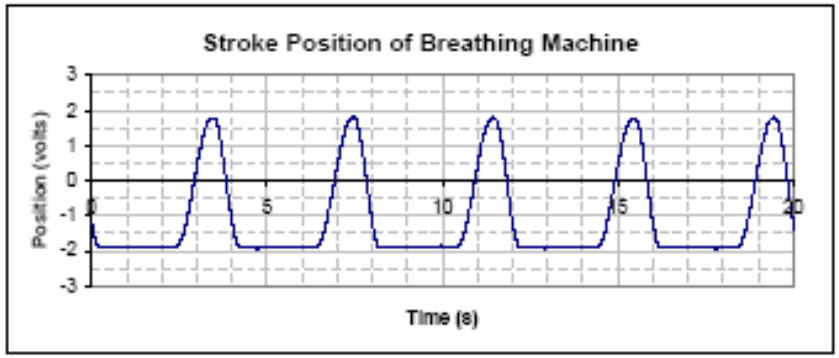


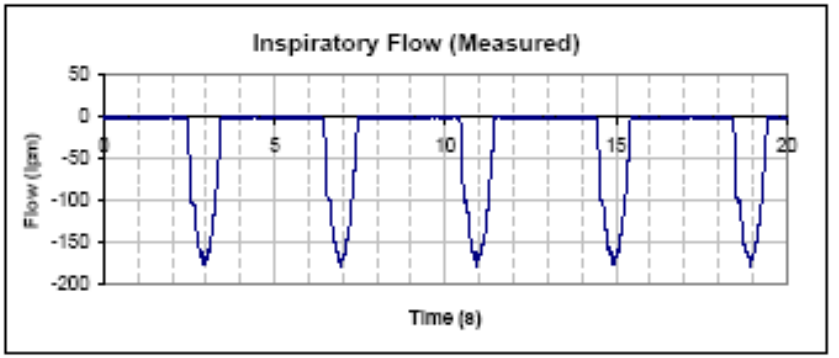


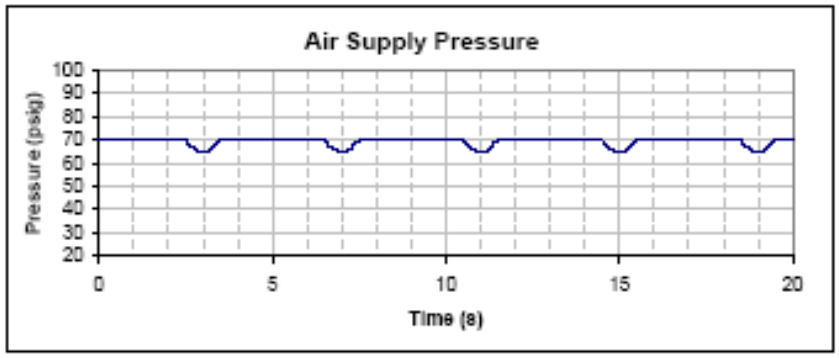


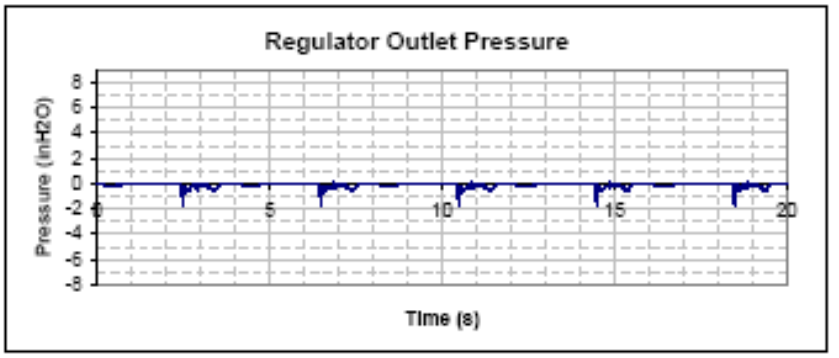
CF188 Oxygen System Compatability Test - NACES Configuration

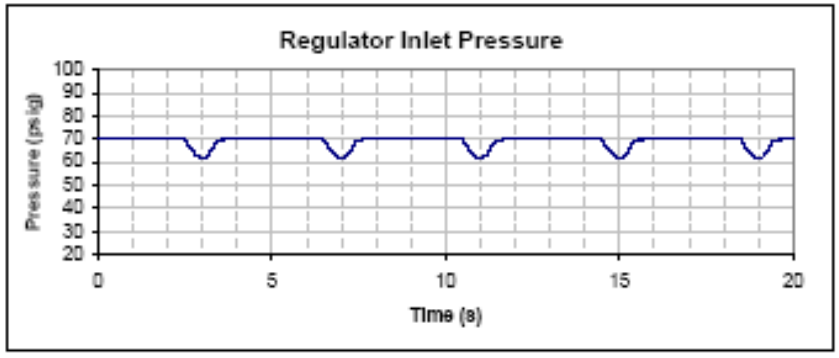
Group:	6 - Varied Breathing Rate & Flows	Settings				Altitude	GL
		Breathing Rate (bpm)	15	Minute Volume (l)	30	Inlet Pressure (psig)	70
Test #:	75	Stroke Volume (l)	2	Peak Inspired Flow (lpm)	180	Regulator Mode	Dilution

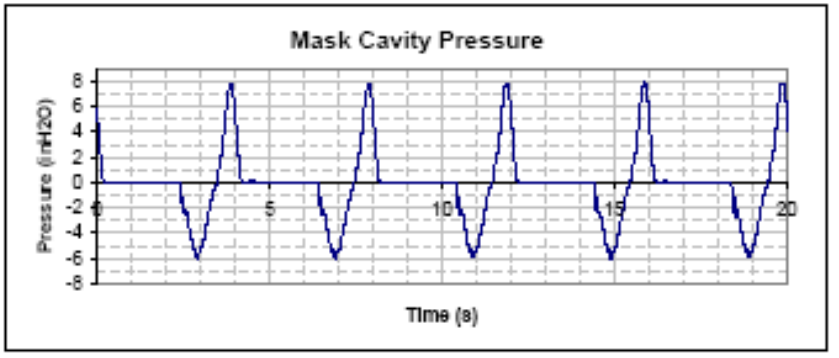






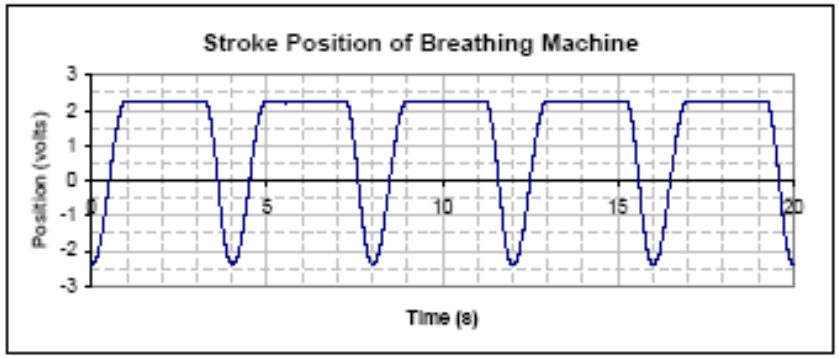


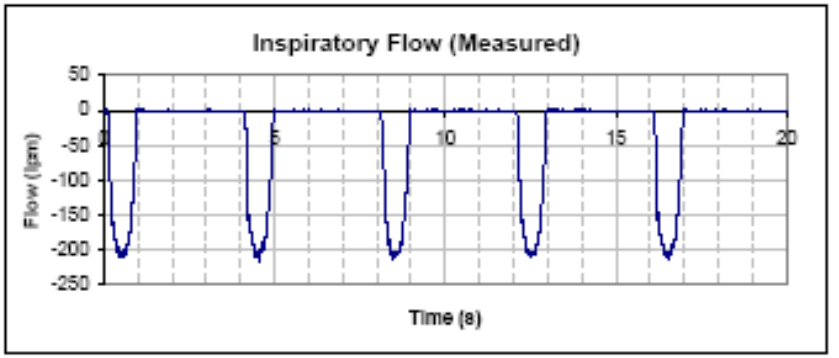


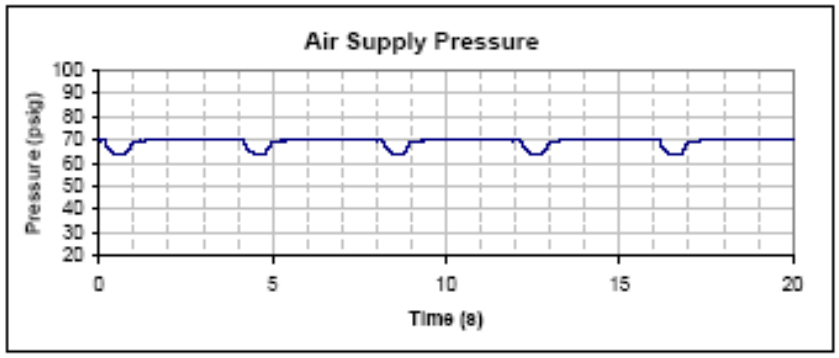


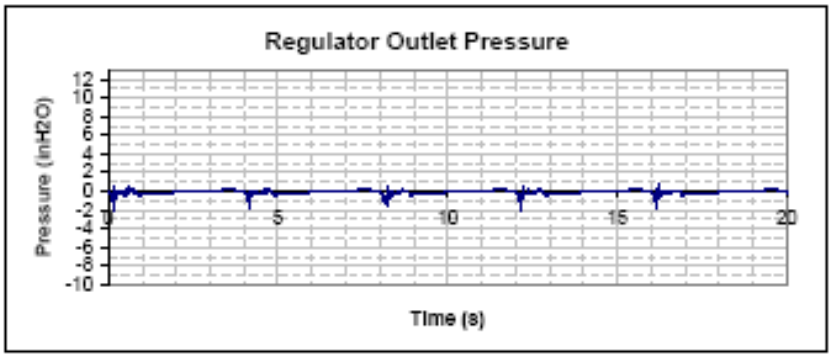
CF188 Oxygen System Compatability Test - NACES Configuration

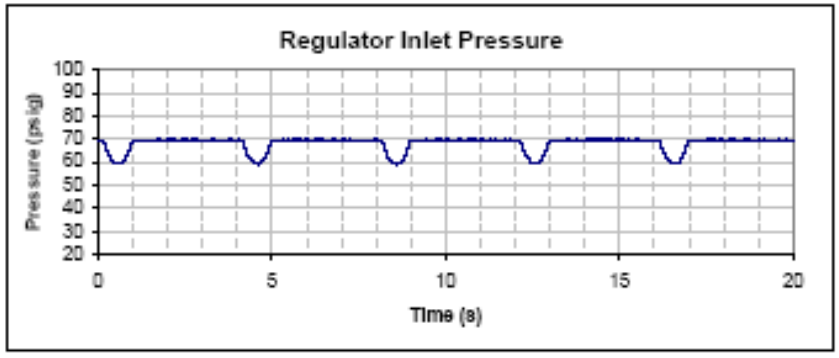
Group:	6 - Varied Breathing Rate & Flows	Settings				Altitude	GL
		Breathing Rate (bpm)	15	Minute Volume (l)	37.5	Inlet Pressure (psig)	70
Test #:	76	Stroke Volume (l)	2.5	Peak Inspired Flow (lpm)	250	Regulator Mode	Dilution

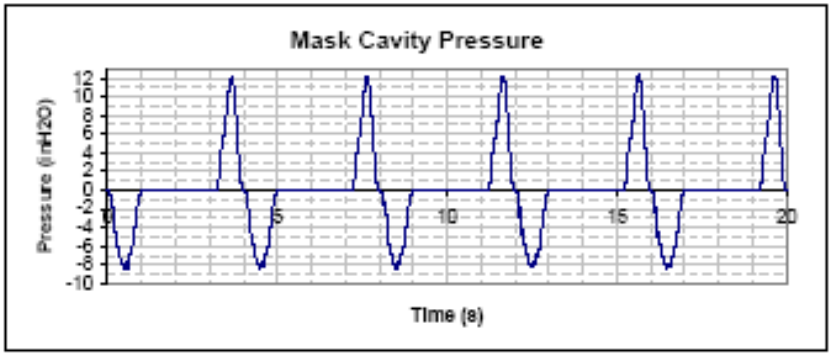






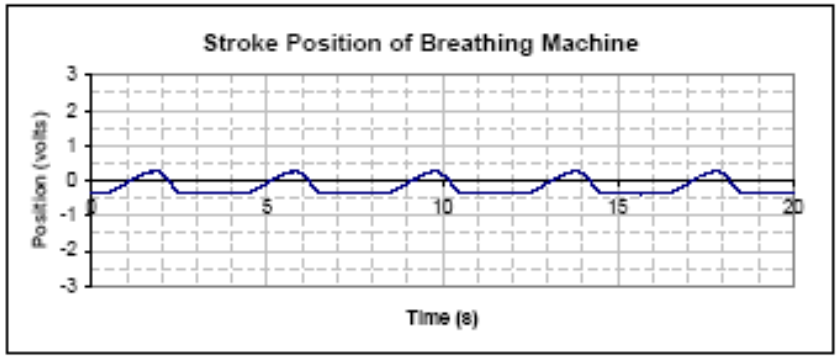


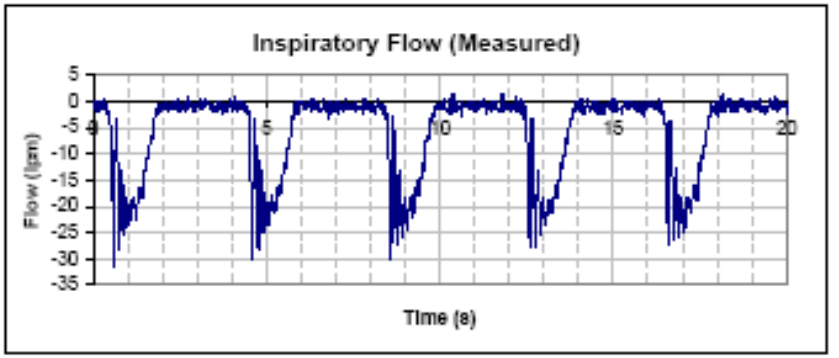


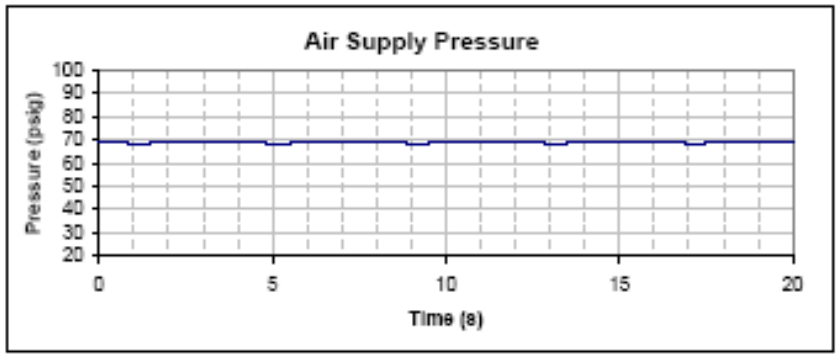


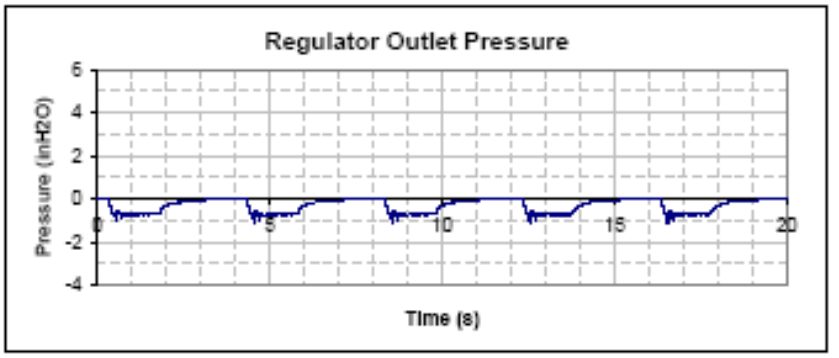
CF188 Oxygen System Compatability Test - NACES Configuration

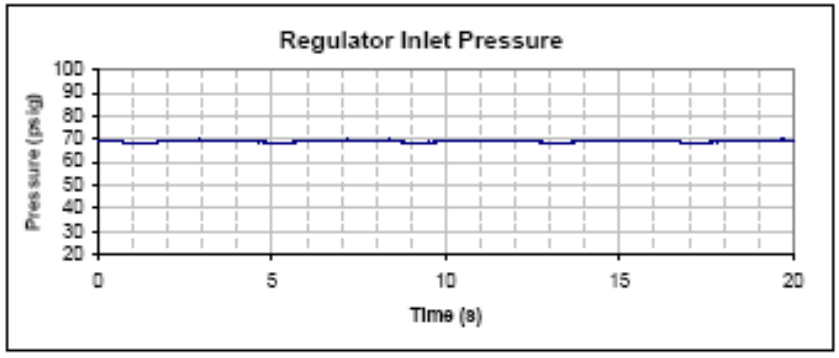
Group:	6 - Varied Breathing Rate & Flows	Settings				Altitude	GL
		Breathing Rate (bpm)	15	Minute Volume (l)	5	Inlet Pressure (psig)	70
Test #:	77	Stroke Volume (l)	0.33	Peak Inspired Flow (lpm)	20	Regulator Mode	Dilution

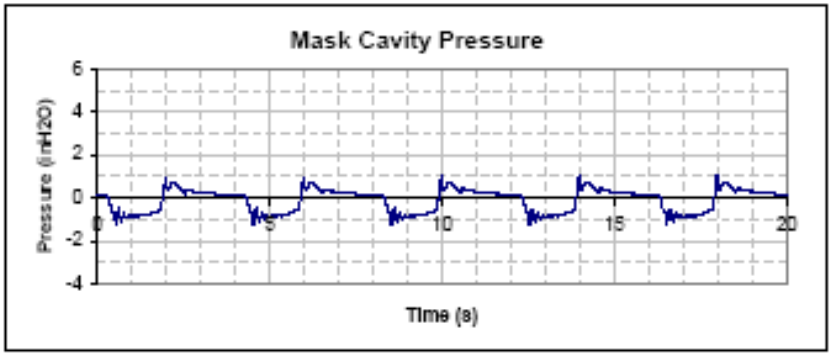






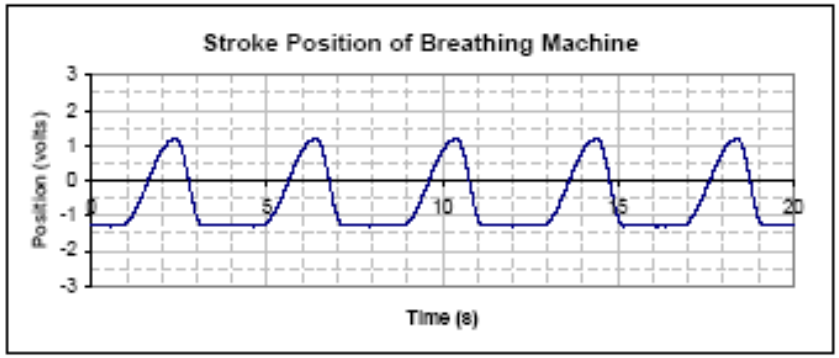


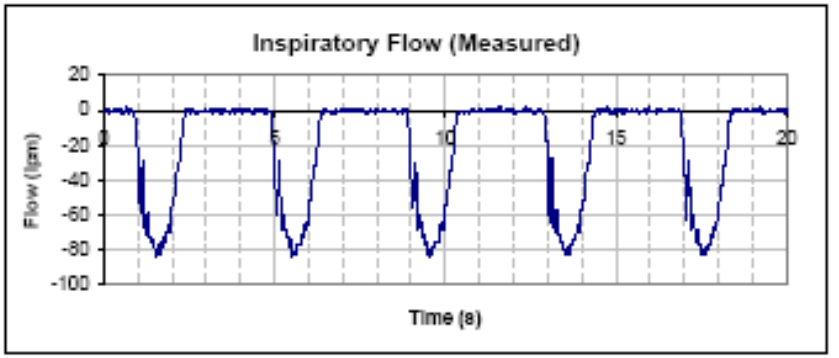


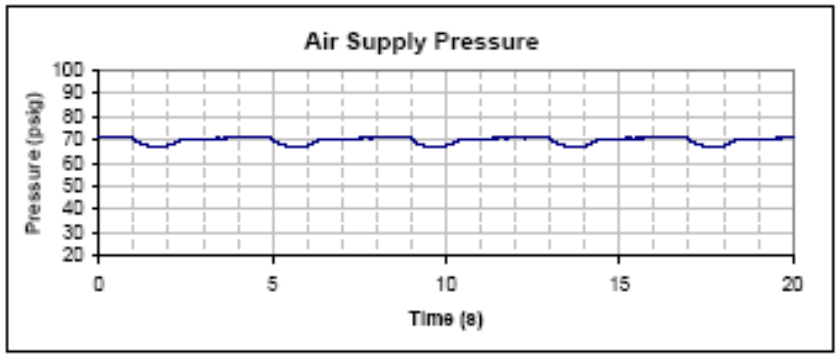


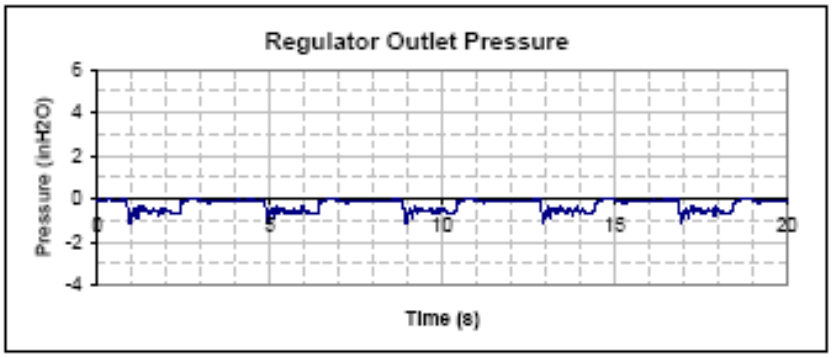
CF188 Oxygen System Compatability Test - NACES Configuration

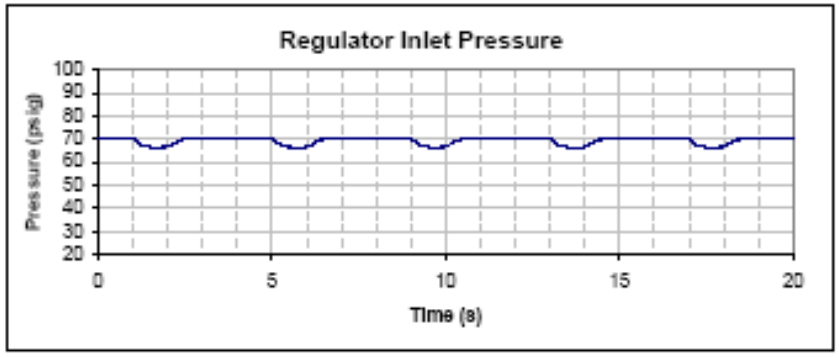
Group:	6 - Varied Breathing Rate & Flows	Settings				Altitude	GL
		Breathing Rate (bpm)	15	Minute Volume (l)	20	Inlet Pressure (psig)	70
Test #:	78	Stroke Volume (l)	1.33	Peak Inspired Flow (lpm)	80	Regulator Mode	Dilution

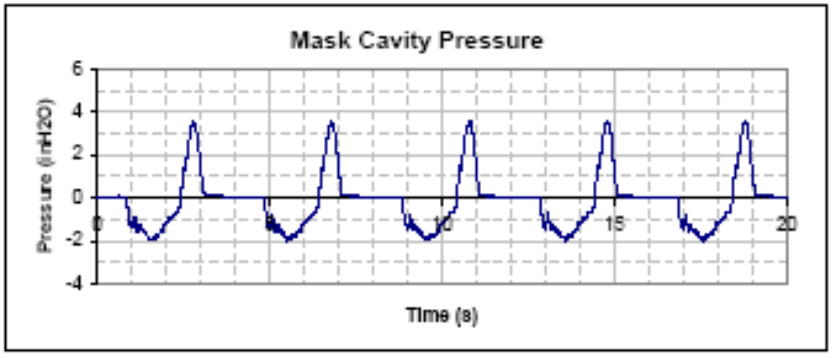






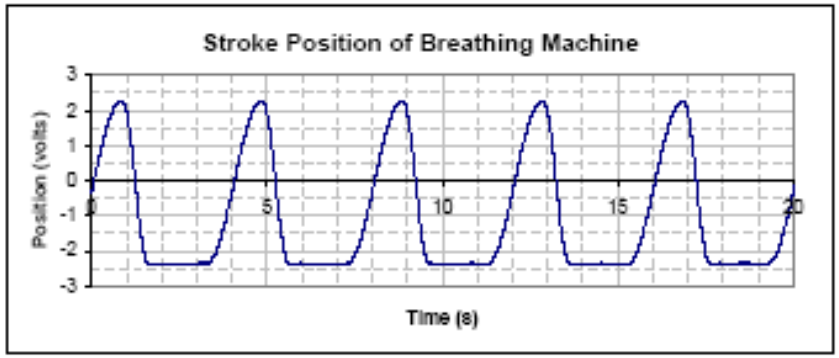


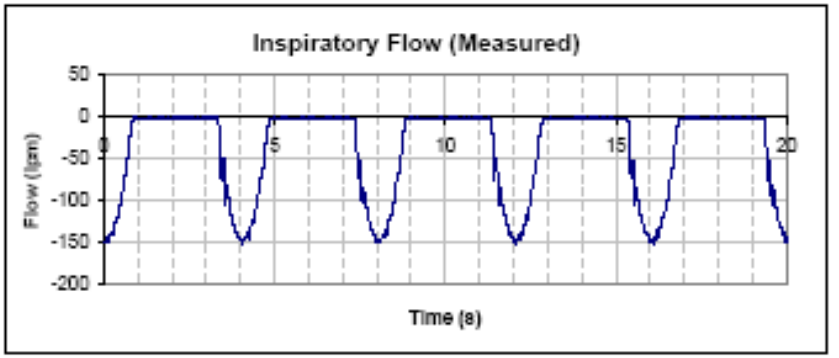


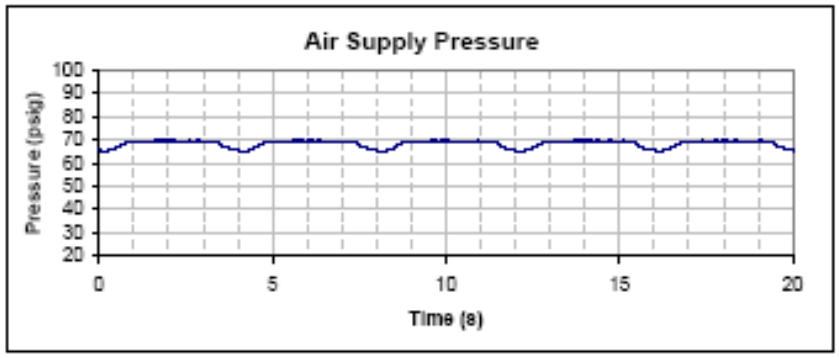


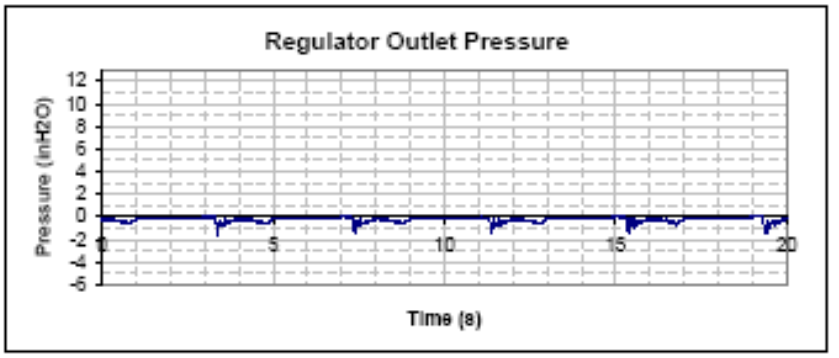
CF188 Oxygen System Compatability Test - NACES Configuration

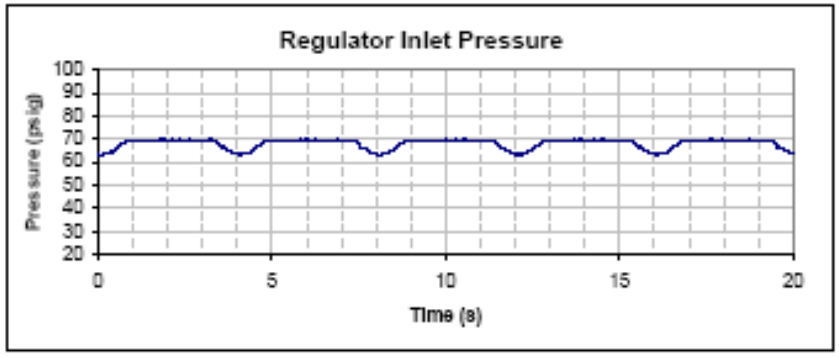
Group:	6 - Varied Breathing Rate & Flows	Settings				Altitude	GL
		Breathing Rate (bpm)	15	Minute Volume (l)	37.5	Inlet Pressure (psig)	70
Test #:	79	Stroke Volume (l)	2.5	Peak Inspired Flow (lpm)	150	Regulator Mode	Dilution

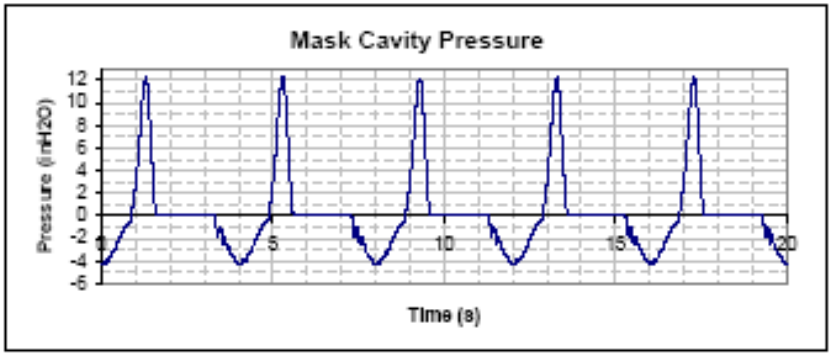






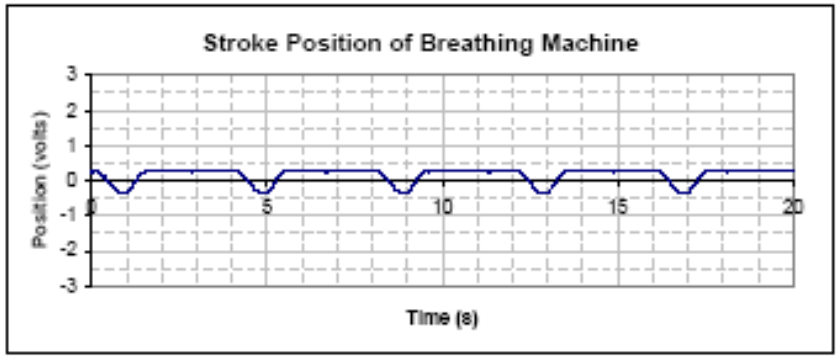


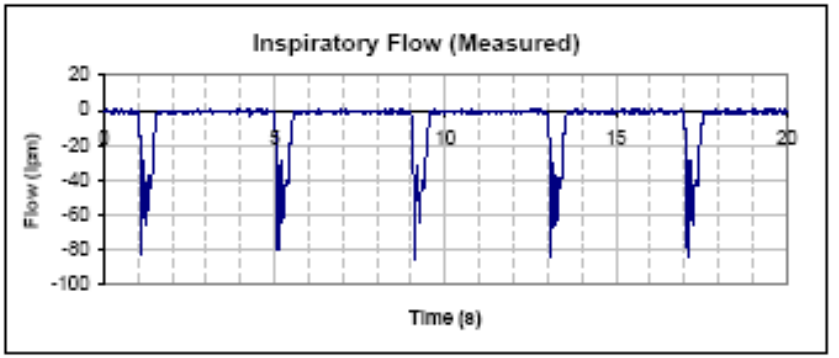


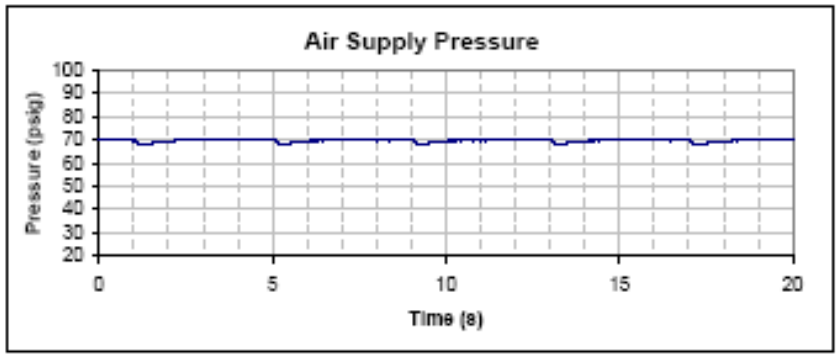


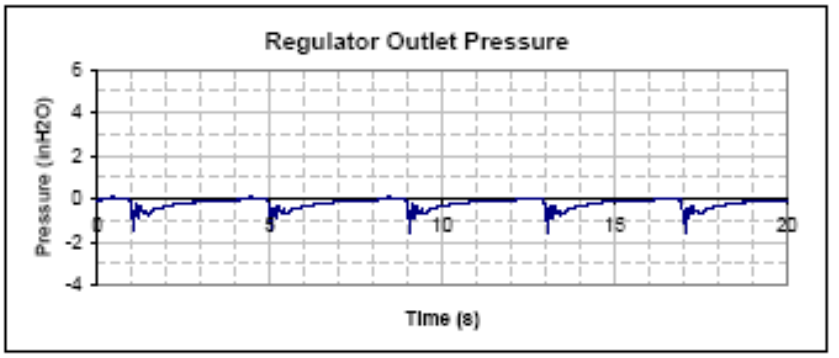
CF188 Oxygen System Compatability Test - NACES Configuration

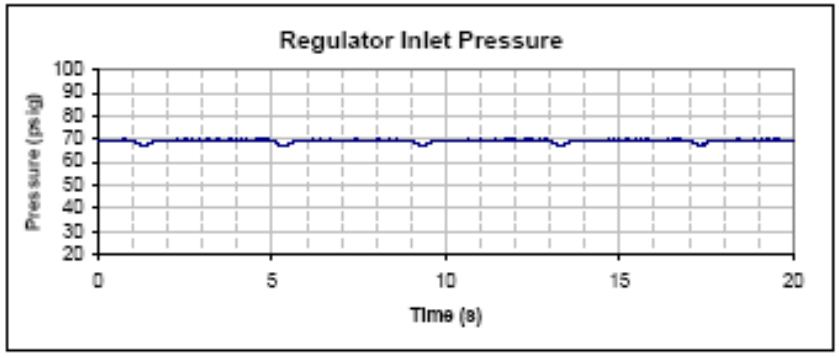
Group:	6 - Varied Breathing Rate & Flows	Settings				Altitude	GL
		Breathing Rate (bpm)	15	Minute Volume (l)	5	Inlet Pressure (psig)	70
Test #:	80	Stroke Volume (l)	0.33	Peak Inspired Flow (lpm)	50	Regulator Mode	Dilution

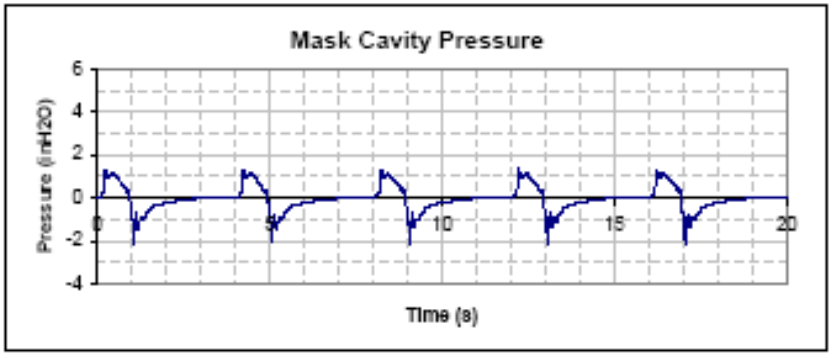






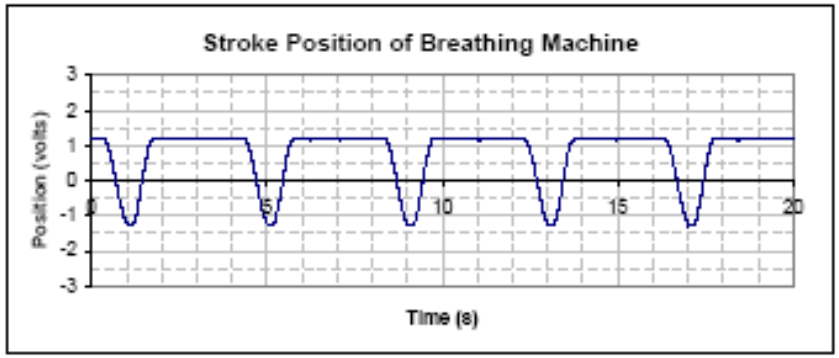


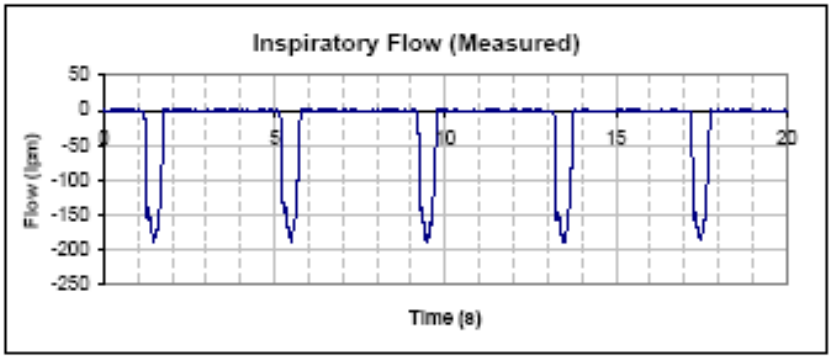


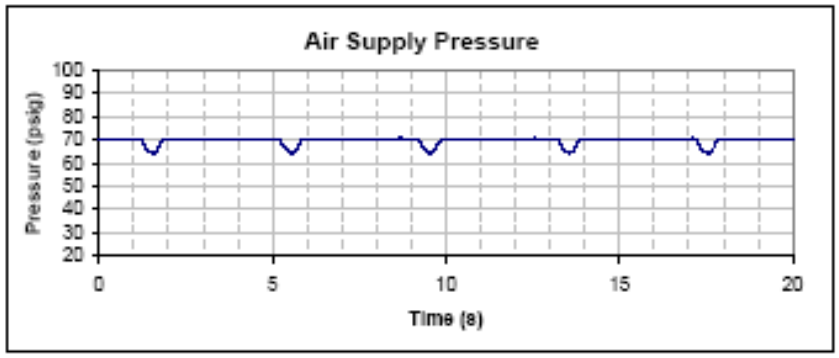


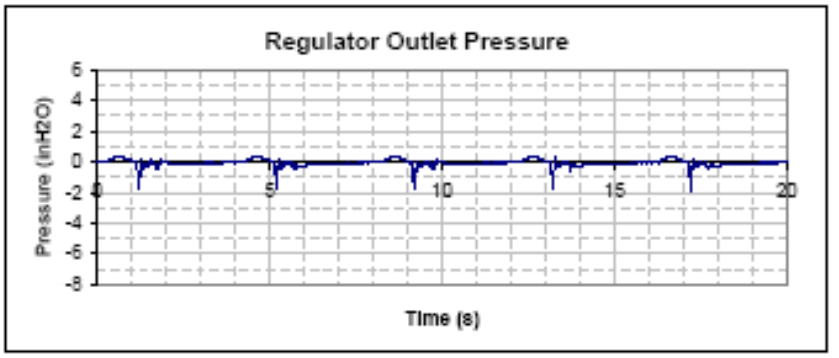
CF188 Oxygen System Compatability Test - NACES Configuration

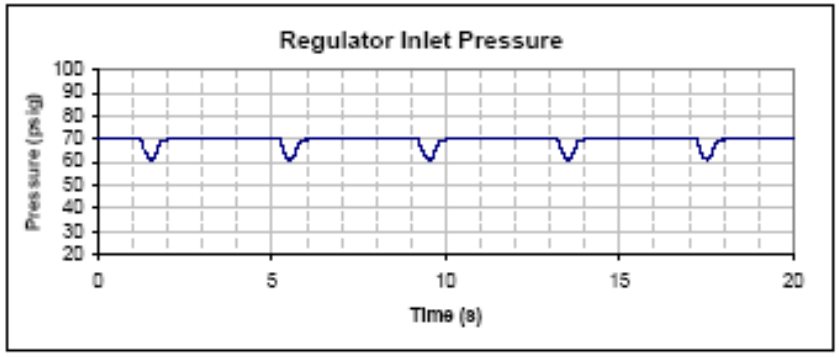
Group:	6 - Varied Breathing Rate & Flows	Settings				Altitude	GL
		Breathing Rate (bpm)	15	Minute Volume (l)	20	Inlet Pressure (psig)	70
Test #:	81	Stroke Volume (l)	1.33	Peak Inspired Flow (lpm)	200	Regulator Mode	Dilution

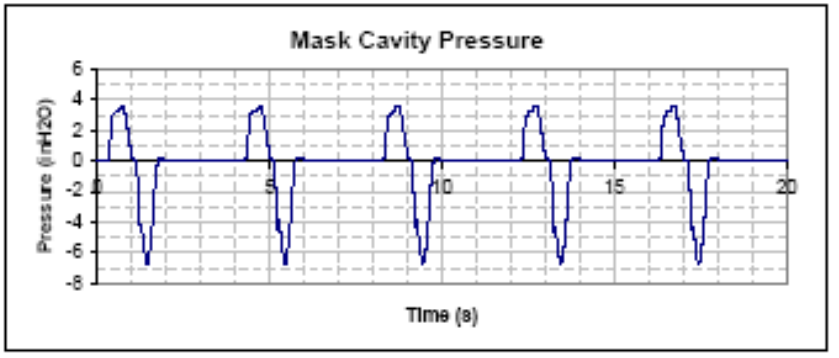






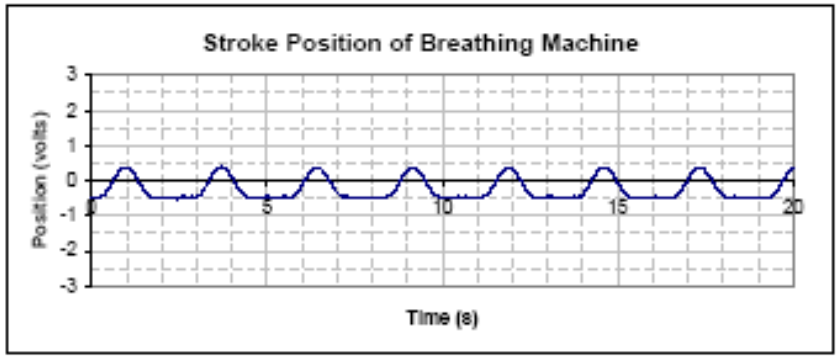


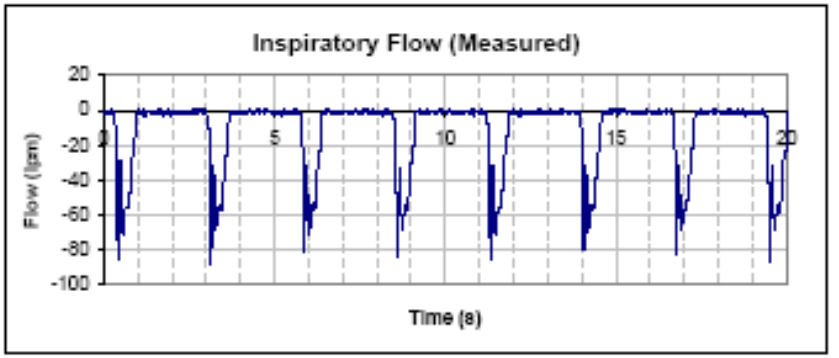


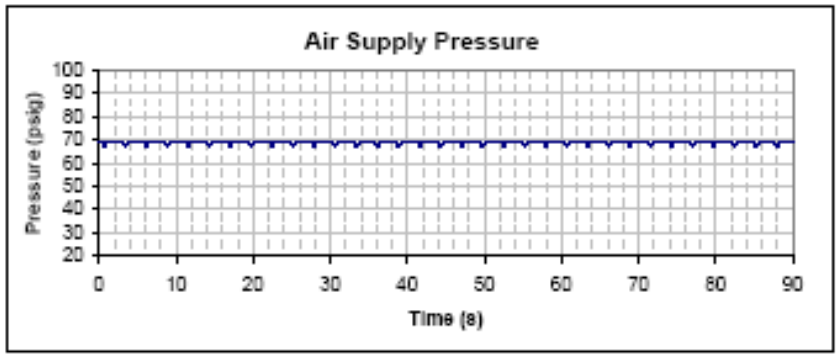


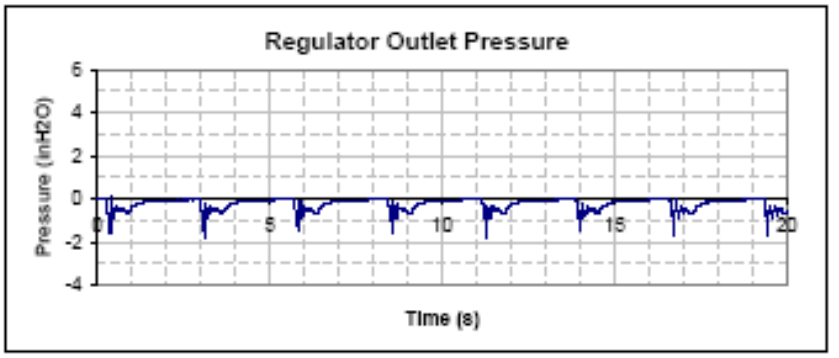
CF188 Oxygen System Compatability Test - NACES Configuration

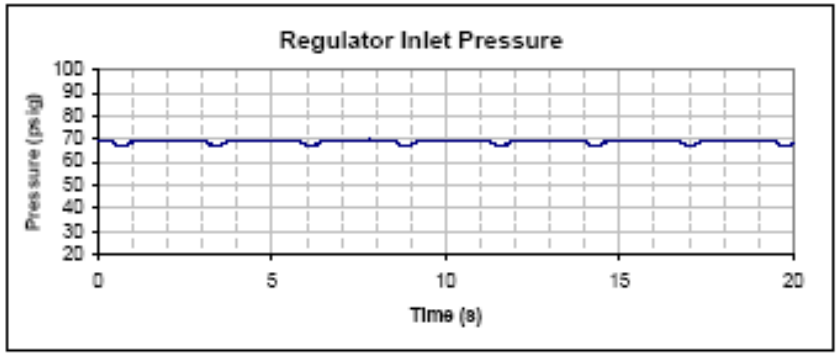
Group:	6 - Varied Breathing Rate & Flows	Settings				Altitude	GL
		Breathing Rate (bpm)	22	Minute Volume (l)	10	Inlet Pressure (psig)	70
Test #:	82	Stroke Volume (l)	0.46	Peak Inspired Flow (lpm)	60	Regulator Mode	Dilution

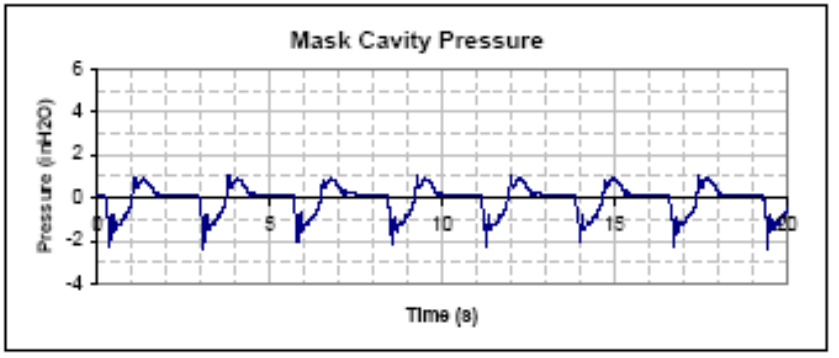






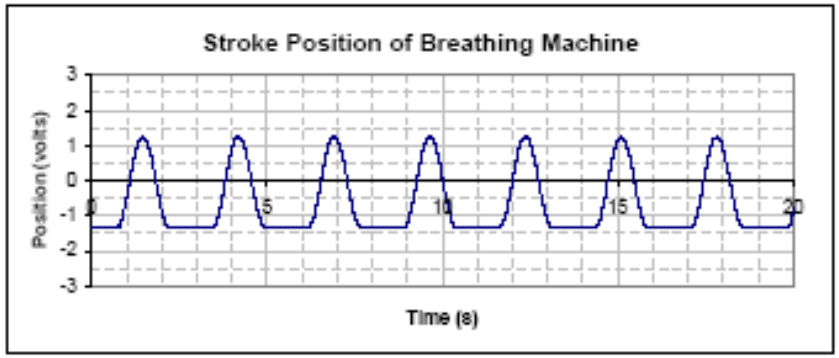


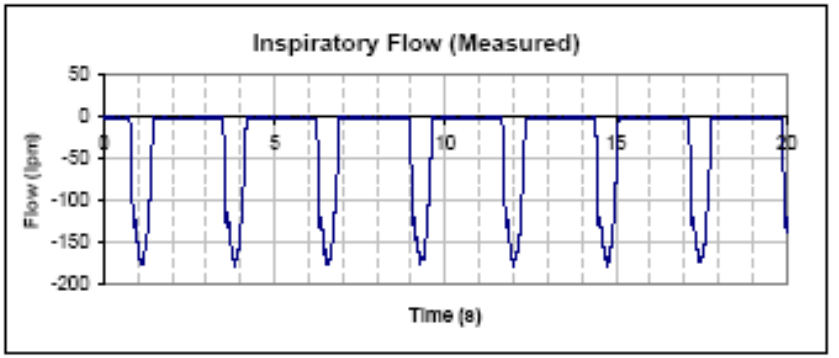


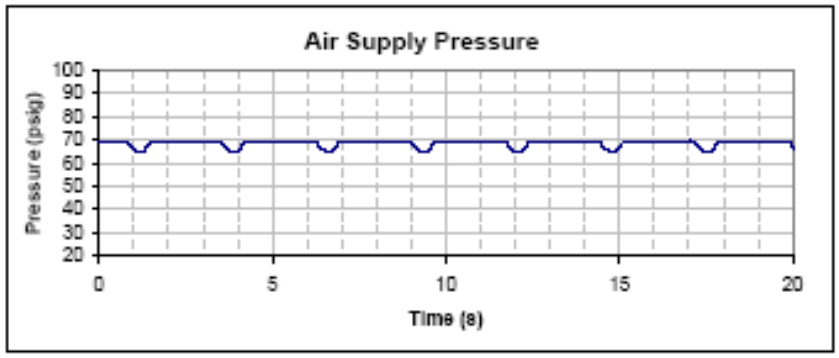


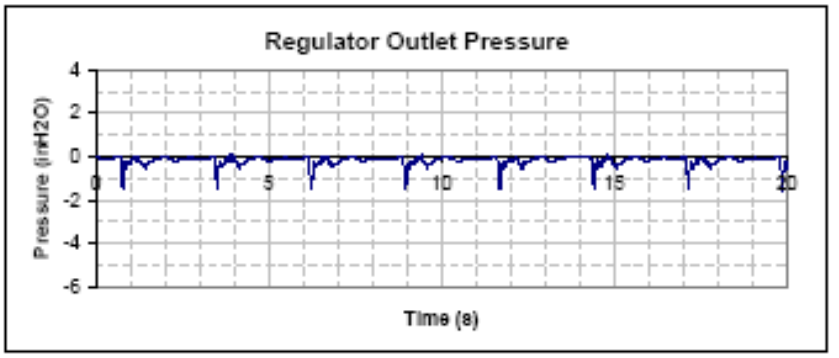
CF188 Oxygen System Compatability Test - NACES Configuration

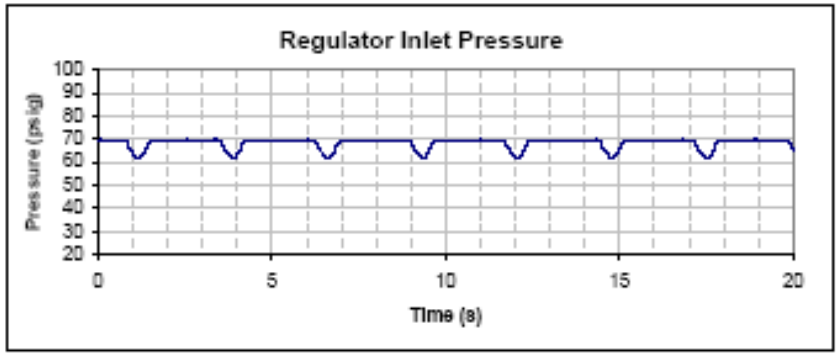
Group:	6 - Varied Breathing Rate & Flows	Settings				Altitude	GL
		Breathing Rate (bpm)	22	Minute Volume (l)	30	Inlet Pressure (psig)	70
Test #:	83	Stroke Volume (l)	1.36	Peak Inspired Flow (lpm)	180	Regulator Mode	Dilution

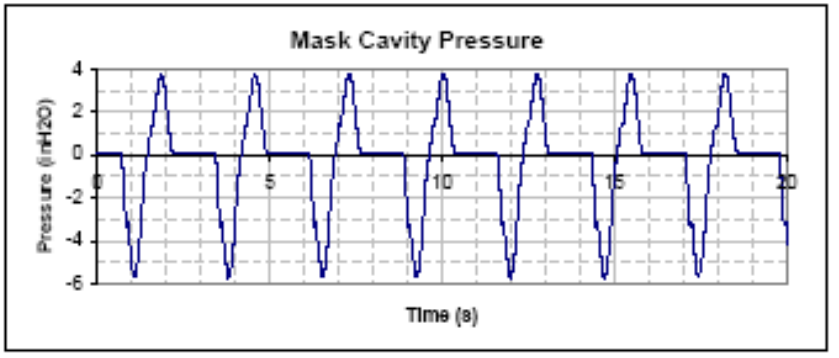






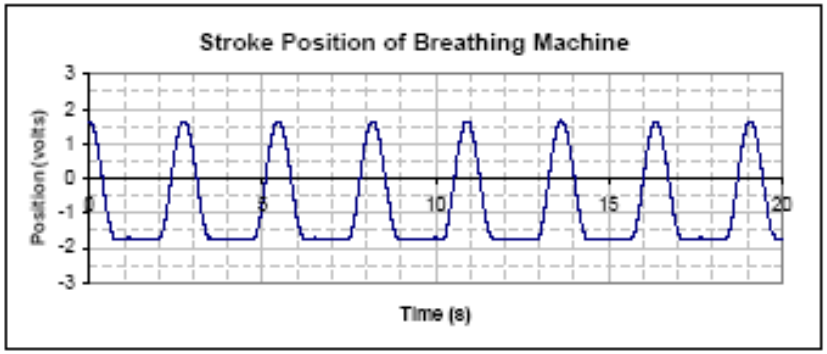


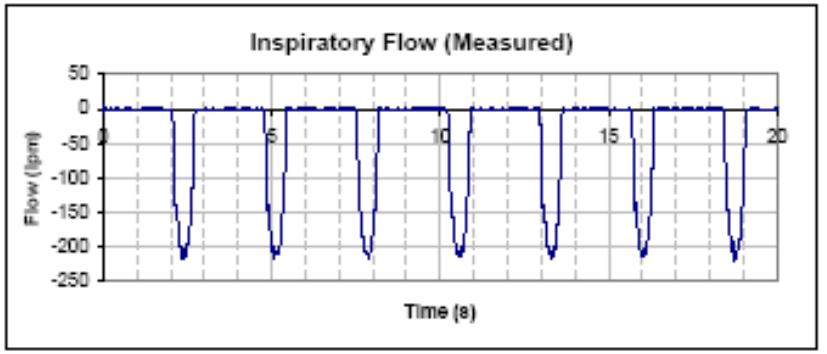


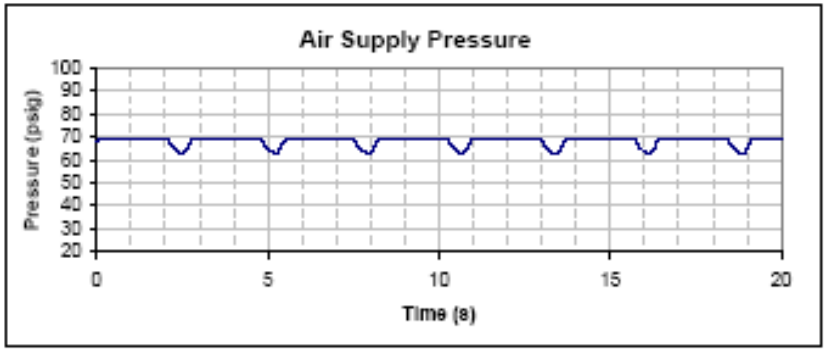


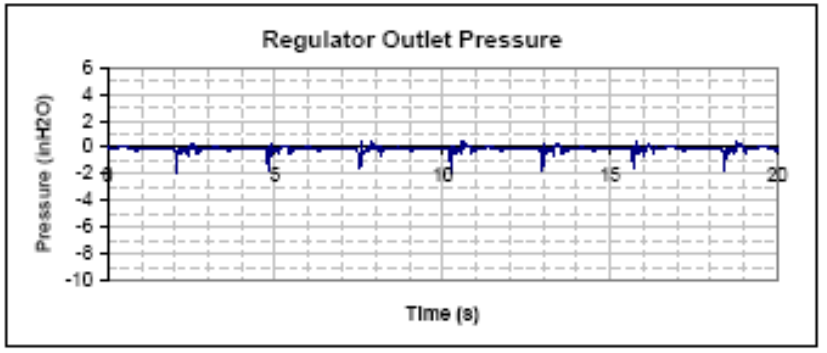
CF188 Oxygen System Compatability Test - NACES Configuration

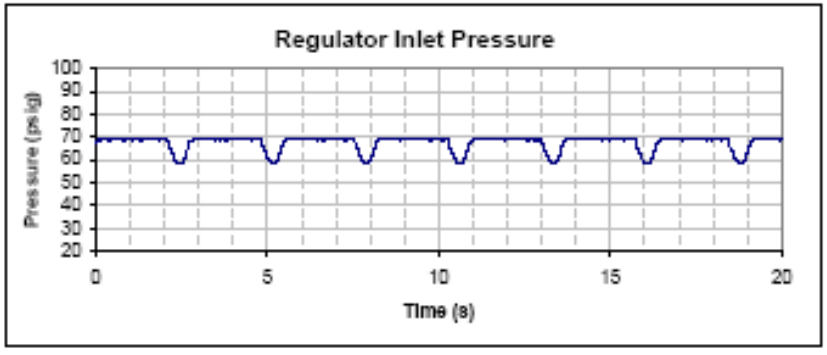
Group:	6 - Varied Breathing Rate & Flows	Settings				Altitude	GL
Test #:	84	Breathing Rate (bpm)	22	Minute Volume (l)	40	Inlet Pressure (psig)	70
		Stroke Volume (l)	1.8	Peak Inspired Flow (lpm)	250	Regulator Mode	Dilution

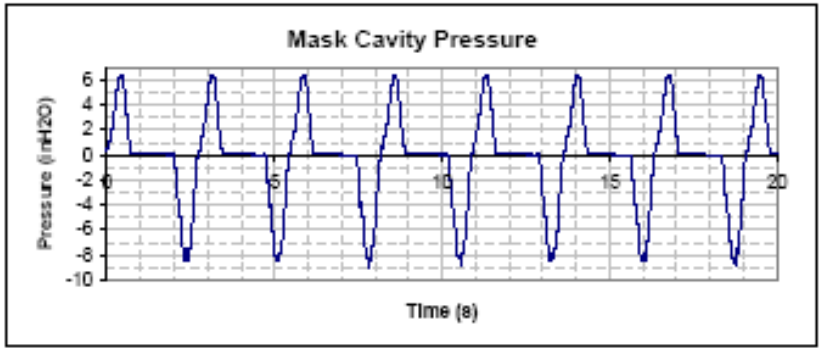












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(U) A series of 84 unmanned tests of the NACES−configuration CF188 oxygen system were conducted to demonstrate compatibility of system components reflected by acceptable flow and pressure characteristics. Results confirmed acceptable system performance in each regulator mode and over the operating ranges of inlet pressure, altitude and breathing profile, varied both individually and in combination.

(U) French abstract not available.

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(U) aircraft, oxygen system, test, compatibility