

# Characterization of the Physical Demands of Tanker- Based Bushfire Fighting

M. Phillips <sup>1</sup>, J. Raines <sup>1</sup>, D. Nichols <sup>2</sup>, S. Cramer <sup>2</sup>, G. McConell <sup>1</sup> & B. Aisbett <sup>1</sup>

<sup>1</sup>Department of Physiology, The University of Melbourne, Vic. <sup>2</sup>Country Fire Authority, Vic

## Background

Fire fighting has been repeatedly identified as a physically demanding occupation (1, 2, 3). Without this knowledge, fire agencies cannot match the capabilities of their fire fighters to the demands of their job, a practice known to enhance productivity and lower job related injury rates (4, 5). The physical demands of common tanker based bushfire fighting tasks are identified. The task demands were previously unknown.

## Methods

Common fire fighting tasks were identified, selected and supervised by CFA operational personnel, Fiskville CFA Training College instructors and an experienced volunteer brigade captain. Simulated bushfire fighting tasks were conducted during April and August 2007 through Greendale and Blackwood CFA brigades. Expired air samples were collected from 22 volunteer fire fighters performing routine bushfire suppression tasks. Expired air samples were analysed to determine oxygen consumption, a principal measure of exercise intensity.



## Results Table 1. Oxygen Consumption & intensity classification of fire ground tasks.

Task	Position/ People	trials	Oxygen consumption ± SD (L·min <sup>-1</sup> )	Intensity level (male) (6)	Intensity level (female) (6)
Static hose spray	Solo	7	0.81 ± 0.26	Light	Moderate
Quickfill pump carry	2 person	6	1.24 ± 0.18	Moderate	Heavy
Quickfill pump trailer set up	2 person	13	1.36 ± 0.23	Moderate	Heavy
Hose advance 80m flat	Lead	6	1.41 ± 0.26	Moderate	Heavy
Blacking out (hose)	2 person	9	1.49 ± 0.35	Moderate	Heavy
Hose advance 80m flat	Assist	6	1.49 ± 0.09	Moderate	Heavy
Manual hose retraction 75m	Solo	8	1.85 ± 0.25	Heavy	Very Heavy
Spot fire rakehoe	Solo	6	2.15 ± 0.58	Very Heavy	Unduly Heavy
Hose advance 80m uphill	Lead	12	2.17 ± 0.49	Very Heavy	Unduly Heavy
Blacking out (rakehoe)	2 person	9	2.20 ± 0.38	Very Heavy	Unduly Heavy
Knapsack hiking	Solo	9	2.29 ± 0.55	Very Heavy	Unduly Heavy
Hose advance 80m uphill	Assist	11	2.55 ± 0.48	Unduly Heavy	Unduly Heavy
Prolonged rakehoe	Solo	8	2.63 ± 0.27	Unduly Heavy	Unduly Heavy
Knapsack spraying	Solo	9	2.65 ± 0.62	Unduly Heavy	Unduly Heavy

## Conclusion

Whilst the research is incomplete, currently the most demanding bushfire fighting tasks involve **load bearing** (knapsack spraying) or **manual tool handling** (rake hoe work). Data collected will be used in the development of a fit for purpose test, designed specifically for tanker-based fire fighting.

## References

1. Davis, P.O. et al.,(1982). *Medicine and Science in Sports and Exercise*, 14(1): 65-71.
2. Gledhill, N. & Jamnik, V.K, (1992). *Canadian Journal of Sports Science*. 17(3): 207-213.
3. Bilzon. J.L.J., et al.,(2001). *Ergonomics*, 44(8): 766-780.
4. Cady, L.D., et al.,(1985). *Journal of Occupational Medicine*, 27(2): 110-114.
5. Rayson, M.,(2000). *Occupational Medicine*, 50(6): 434-436.
6. McKardle, W.D, et al., (2000). *Essentials of Exercise Physiology: 2nd Edition*. Lippincott & Williams.