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# OPERATIONAL READINESS IN RURAL FIREFIGHTERS DURING BUSHFIRE SUPPRESSION

***“AWAKE, SMOKY & HOT”***

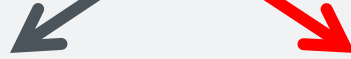
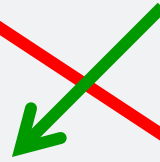
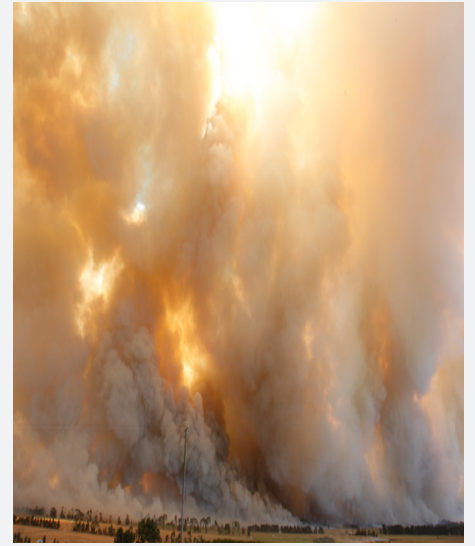




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“...conduct industry-specific research to assist the fire industry to develop comprehensive policy, best practice guidelines, and training and educational materials to preserve the health and safety of their firefighters during **multi-day bushfire suppression** deployments”

1. Work with key fire industry informants to validate a three-day bushfire suppression tour simulation;
2. Investigate the impact of, and interaction between, multiple fireground stressors (i.e., sleep disruption, heat and smoke) on firefighters' physiological responses, physical and cognitive work performance across a simulated three-day bushfire suppression tour;
3. Present the research findings to key fire industry stakeholders to inform comprehensive policy, best practice guidelines, and training and educational materials for the preservation of firefighters' health and safety.

**“... degree of correspondence between real-world operations and simulated activities...”**

**A number of elements to consider:**

- Physical – ‘does it look the same’?
- Perception – ‘does it feel the same’?
- Measurement – ‘will it perform consistently’?

**Three phases:**

1. Data collection
2. Design and Development
3. Trial and Refinement

## Physically Demanding Tasks

1. Advancing 'charged' 38 mm hose
2. Laterally moving 'charged' 38 mm hose
3. Full reposition of 'charged' 38 mm hose
4. Rapid manual tool work
5. Team manual tool work
6. Solo manual tool work
7. Manual tool work during black out



# PHASE ONE: DATA COLLECTION

## Frequent, Intense, Long Tasks

Task	Frequency	Mean HR (beats·min <sup>-1</sup> ) (%HR max)	Peak HR (beats·min <sup>-1</sup> ) (%HR max)	Speed (m·s <sup>-1</sup> )	Duration (s)	Type (Hose, Rake, Misc)
Blacking out work using 38-mm hose	41	126 ± 24 (71.9 ± 15.3)	131 ± 24 (75.0 ± 15.0)	0.26 ± 0.19	76 ± 70	Hose
Lateral repositioning 38-mm hose	103	127 ± 23 (71.5 ± 12.6)	130 ± 23 (73.2 ± 15.5)	0.40 ± 0.29	17 ± 14	Hose
Operating 38-mm hose	41	124 ± 19 (69.8 ± 10.6)	129 ± 20 (72.4 ± 10.8)	0.34 ± 0.37	40 ± 58	Hose
Making up 38-mm hose on bite	5	155 ± 24 (82.1 ± 12.9)	164 ± 25 (86.8 ± 13.2)	0.40 ± 0.26	62 ± 47	Hose
Team line building	1	157 ± 15 (86.2 ± 10.8)	168 ± 10 (92.2 ± 7.7)	0.14 ± 0.08	461 ± 387	Rake

## Deployment Conditions:

- **Fireground data collection:**
  - Shift Durations & Temperatures (Raines et al., 2011);
  - Air TOXICS (Reisen & Brown, 2009; Reisen et al., 2011)
  - Sleep Patterns (Cater et al., 2007)
  
- **Industry consultation:**
  - Fatigue Workshop (May 21<sup>st</sup>, 2010);
  - CFS & CFA informants (throughout 2011).



# PHASE TWO: DESIGN AND DEVELOPMENT

## CONTROL CONDITION

### PRE STUDY

0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	0000	0100	0200	0300	0400	0500	
Participants at home/work													Evening briefing, begin learning		Sleep opportunity									

### DAY ONE

0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	0000	0100	0200	0300	0400	0500
	Eat, clean etc	Study briefing, task familiarization				L D •	L N D	T1**	T2	T3		D i n n e r	T r a v e l •••	Shower, wire-up etc.	B E D #	8h sleep opportunity ##							

### DAY TWO

0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	0000	0100	0200	0300	0400	0500
wake eat etc	T r a v e l	T1			T2		L u n c h	T3	T4	T5		D i n n e r	T r a v e l	Shower, wire-up etc.	B E D	8h sleep opportunity							

### DAY THREE

0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	0000	0100	0200	0300	0400	0500
wake eat etc	T r a v e l	T1			T2		L u n c h	T3	T4	T5		D i n n e r	P a s s i v e T r a v e l	Shower, wire-up etc.	B E D	8h sleep opportunity							

### DAY FOUR

0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	0000	0100	0200	0300	0400	0500
Physiological	Breakfast then home.	Participants at home/work																					

# PHASE TWO: DESIGN AND DEVELOPMENT



May 2011: AFAC OH&S Sub group

- Subtle changes to raking task

July 2011: CFA Fiskville – ‘real firefighter’ input

- Changes to blacking out, lateral repositioning

August 2011: CFS Brukunga – ‘real firefighter participants’

- Changes to equipment, sequencing

September 2011:

- Bushfire CRC Conference Science Day
- ‘Real’ filled hoses – adding weight & realism

## November 2011:

- Full three-day tour testing @ CFS Brukunga
- Five CFS volunteer firefighters
- Formal post-testing debrief & verification session (recently piloted with good feedback)
- Critical last step in trial and refinement

## November 2011 – February 2012:

- Any modifications following Brukunga
- Reliability of physical work circuit performance (within & between days)
- Physiological validity of physical work circuit
- Environmental stability of testing venues for high temperatures and carbon monoxide levels

- 18 testing periods booked for 2012 (Vic, SA)
  
- Project leaders to engage with;
  - Additional agencies (TFS, ACT RFS);
  - Brigade members (CFA, CFS).
  
- Data collection team;
  - 2 × research officers
  - 3 PhD students (one more pending approval)
  - 2 Honours students (TBC)
  - Casual research assistants as required

## *Project Leads*

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