Firefighting and Decision Making: An Australian Perspective

Dr. David Launder  B.Ed. MA DBA

MFS Director Organisational Development
We believe that decision making is of critical importance to the fire industry. On average about 80 firefighters die in the line of duty each year in the United States. Approximately half of these deaths are linked to decision errors.

In 2009 Grant Lupton sponsored doctoral research to improve the operational decision making of MFS personnel.

This research identified five common decision making behaviours that we are trying to actively develop with our agency.

The aim of this presentation is to share our findings, their implications and potential strategies that may improve organisational decision making.
The Australian context

- The UK has been at the forefront of applying psychological research in structural firefighting contexts. In the US Gary Klein and others have identified the importance of ‘naturalistic’ decision strategies in fire and military settings.
- In contrast most research in Australia has involved bush/wildfire.
- We have six States and two Territories each with at least one fire service. Significant distinctions between urban and rural firefighting.
- Compared to either the US or UK/Europe we are a small industry with a small funding base.
- Without bodies like the IFE there would be very little urban fire research being considered by Australasian authorities.

Population:
- Europe approximately 500 million
- Australia 23 Million
- Adelaide 1.4M
Decision Making

People make decisions everyday.

We judge people on their ability to make good decision. Just one bad decision may haunt you for years.

Decision making is of great importance to those who work in high risk, low time settings such as the emergency services.

And, Sheldon’s inability to make a decision may turn out to be relevant to us…….
Developing and maintaining situational awareness

Using an appropriate decision strategy (from a spectrum of possible styles)

Establishing a clear picture of what can be achieved (objectives) and later a more formal ‘plan’

Using ‘Action’ behaviours including communication, coordination and control to implement decisions and implement reasonable safety systems

Continually reviewing the effectiveness of decisions and their implementation against the changing incident.
The importance of situational awareness is well established:

- Perceiving situational cues, understanding what is going on around you and accurately predicting future events. (Endsley 2000)
- Having the ability to see bad things coming in time to change the outcome (Gassaway 2013)

Level 1 – Perception
- Perceiving (seeking and identifying) important cues in the current situation

Level 2 – Comprehension
- Understanding and making sense of these cues and the current situation

Level 3 – Projection
- Projecting (predicting) future events by using previous experience
‘Information alone is useless; you need to turn it into intelligence. … You have to know what the implications are for the current and future fireground situation’

1. Our officers consider consistent ‘information sets’ when establishing situational awareness.

2. Consistent behaviours are employed by officers to obtain situational information.

3. Our officers identified prior experience as the most critical factor and repeatedly provided examples of comparing a current situation to one previously encountered.

4. There are different emphasis placed on situational awareness by incident managers of different rank.
Please watch the video and consider:

What cues are important?
- Structure?
- Smoke behaviour?
- Firefighter actions?

What is happening?
- What is the fire doing?
- What are the firefighters doing?

What will happen?
- Does this feel right?
- When the video stops, what do you think is about to happen?
Does your situational awareness match?

Level 1 – Perception
- Solid, sealed structure (compartment). High volumes of smoke coming out of house under pressure, no visible flame. Firefighters in/out of door, uncharged hose line (which is used to break the window from inside).

Level 2 – Comprehension
- High fuel load and temperature in the structure. Insufficient oxygen for fire to burn freely (because it is a sealed compartment). Firefighter actions change this situation.

Level 3 – Projection
- What is likely to happen now that oxygen has been introduced?
- Do firefighting actions match the evolving situation?
Can you stay ahead of the video?

What is going to happen now?

How fast is it going to happen?

What would you do if you saw this happening?
‘When there wasn’t much time I relied on my experience to make (recognition-primed) decisions, where necessary, I followed the procedures. It’s when you have more time that you can either modify from the procedure or consider options.’

1. We found that Incident managers employ a range of decision methods on the fire ground.
   
   In the vast majority of cases where there is high-risk and low-time these decisions are intuitive (recognition primed) that require extensive prior experience to be effective.

2. The type, speed and effectiveness of decisions is influenced by:
   - The amount of time available (real and perceived)
   - Level of experience (number and frequency of incidents and training, not years of service)
   - Organisational values (our firefighters will take risks to save saveable lives)
   - Confidence – confidence in self and personnel tends to enable more aggressive tactics, lack of confidence and uncertainty results in indecision and delay.
We found that Incident managers employ a range of decision methods on the fire ground.

We adapted a number existing models to incorporate our research findings into a decision framework.

Adapted from Crichton 2003
Example of Recognition Primed Decision Making

- When facing bowlers at 90mph + batsmen have less than 0.5 second to read the delivery and play a shot.
- At 98 mph they have to start the shot before the ball is bowled.
- How do they ever hit the ball?

**Answer:** By facing *thousands of deliveries* it has become intuitive. But, do we get close to these levels of practice and repetition?
I got some initial objectives and tactics in place while I was still building a better picture of the fire and what was going on. Once I got things moving I became less involved so I could start formalising the plan.

1. Three key planning behaviours were identified:
   - the formalisation of objectives
   - the formalisation of a strategic mode and aligned tactics
   - formalisation of incident management roles (and structure)

2. Planning behaviours are at the onset intuitive and are only formalised (documented) if and when time becomes available

3. Senior officers consistently raised delays in formalising the plan as a significant problem with evolving incidents.
Summary of findings (Actions)

‘Coordination is consciously applied to prevent freelancing; the only excuse for self-tasking is where a crew sees a risk requiring immediate action. Control is about the systems you put in place for accountability so you know what people are doing and at the end of the day everyone goes home safe’.

1. Incident managers employ three key action behaviours:
   - communication
   - coordination
   - control

2. Action behaviours were considered essential for the successful implementation of the plan and to ensure the safety of firefighting personnel and the public.

3. Officers considered effective ensured these behaviours commenced as early as possible and closely monitored them.
The building on fire may lose its structural integrity, and people get tired and make bad decisions or sometimes get a false confidence. I don’t think you can take your eyes off a fire like this.

1. Our officers considered dynamic review behaviours essential to monitor the changing risk level of the fire and to evaluate the effectiveness of firefighting operations.

2. Officers match the evolving incident against their mental picture (model) of how it should be progressing.

3. Effective officers identify discrepancies early and implement changes to bring the incident back on track.
Factors that Impact on decision making

Lots of things can effect the quality of situational awareness and decision making:

- **Inexperience** - don’t know what to look for, no experience to ‘pattern match’, greater anxiety
- Biases: ‘gambler’s fallacy’ etc…
- Assumptions or expectations
- Inconsistencies in values, procedures
- Confidence,
- *Limits to our brain’s abilities to maintain situational awareness and make decisions: bias tendencies (Sallis et al 2013), gradual change and task focus.*

How can experienced, highly professional firefighters miss important cues that would tell them they are at risk?
Change Blindness

We are good at spotting sudden change.

But, we can be blind to gradual change even when we are told it is going to happen.

Not all fires evolve rapidly.

Internal visibility is usually compromised so it is difficult to see changes unless they are obvious.

Modern PPE insulates so well that changes in temperature may not be noticed.
Task Focus

Concentrating on a task impacts on our ability to read a situation.

If you have seen this before try really hard to count and see what happens....

Or, it's easy to miss something when you are looking for something else.
The role of emotion, values and confidence in decision making

Our emotions and values can direct and speed our decision making by telling us ‘the right thing to do’.

Organisational values can result in conservative or high risk decision making or paralysis if there are inconsistent messages to personnel.

Loss of confidence can severely impact on decision making.
Crews responded to house fire, reported possible occupant (possible impairment)

Stone construction, tin roof, windows shuttered

On arrival very little smoke showing

Off-duty firefighter entered house and identified possible room of origin (also opened door to room)

Three two-man crews S&R, each had at least one senior firefighter

At approximately 17 minutes both members of 1st team suffered scald burns

Rescue performed

SFF suffered most serious burns
**Case Study: Beverley House Fire**

<table>
<thead>
<tr>
<th>Situation</th>
<th>Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off-duty SFF reported: good visibility and could see down hallway.</td>
<td>Gradual change</td>
</tr>
<tr>
<td>10 minutes later thick black smoke present but rooms could be accessed</td>
<td></td>
</tr>
<tr>
<td>easily.</td>
<td></td>
</tr>
<tr>
<td>Despite presence of thick black smoke high pressure lines were deployed.</td>
<td>Potentially flawed situational awareness</td>
</tr>
<tr>
<td>Internal crews were deployed to conduct search and rescue operations,</td>
<td>Task focus</td>
</tr>
<tr>
<td>also carrying HP line.</td>
<td></td>
</tr>
<tr>
<td>Crew without thermal imaging camera was unaware of high temperatures</td>
<td>Limited situational awareness</td>
</tr>
<tr>
<td>S/R Team suffered burns after PPE became ‘heatsoaked’</td>
<td>Gradual change</td>
</tr>
<tr>
<td>Fireground communications were impacted by radio failures.</td>
<td>Situational awareness, action and review impacted</td>
</tr>
<tr>
<td>Two (2) person BA teams deployed</td>
<td>Task focus, cognitive overload, gradual change</td>
</tr>
</tbody>
</table>
We identified three key areas where this research had implications. These were:

1. **The recruitment and promotion of personnel**
   - Ensuring the ability to make decisions under pressure is a key selection criteria

2. **Learning and development**
   - Providing personnel with explicit training in decision making
   - Ensuring training activities develop ‘thinking firefighters’

3. **Organisational systems of work**
   - Ensuring policy and procedure are consistent with human factors and organisational values
   - Modifying work practices - **for example 3 in rather than 2 in (officer and 2 crew)**
<table>
<thead>
<tr>
<th>Methodology</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical training drills</td>
<td>Develop technique but often out of context, do not develop ability to read different situations and decide which technique(s) to apply.</td>
</tr>
<tr>
<td>Live Fire training</td>
<td>Can develop situational awareness, and actions (technical execution). Reburnables and gas props may result in negative transfer / flawed situational awareness if inaccurate simulations.</td>
</tr>
<tr>
<td>Videos</td>
<td>Low-cost, allow repetitive development of all three levels of situational awareness. Can be edited and used as both learning and assessment tool. Can also be combined with many other methodologies for example precursor to training drill, post incident review, mentoring etc. Used in isolation does not develop action or review behaviours.</td>
</tr>
<tr>
<td>Knowledge development/examination</td>
<td>Increased knowledge base can range from out of context fact recall through to applied knowledge. Has potential to improve all decision behaviours. Bad examinations reward parroting, good examinations can require environmental cue recognition and decision making (think medical case exams).</td>
</tr>
<tr>
<td>Computer simulation</td>
<td>Can allow repetitive training of planning, action and review behaviours. Limited development of situational cues and therefore decision making (think learning to read faces by watching the Simpsons). Ability to splice real video (visual cues) improves SA component.</td>
</tr>
<tr>
<td>Train as you play – Play Practice</td>
<td>Contextualised training scenarios combine SA, decision making and technical execution. Difficult to safely and realistically replicate high-risk situations.</td>
</tr>
<tr>
<td>Pre-mortems &amp; Pre-plans</td>
<td>Develop situational assessment skills, increase experience / memory bank of potential solutions for situations that may be encountered. Allows sharing of expertise. Repetition will facilitate procedural decision making and RPD. Do not actively engage decision behaviours or actions.</td>
</tr>
<tr>
<td>Mentoring &amp; Apprenticeship</td>
<td>Maximises ‘shared’ experience and learning similar to pre-mortems. Shared cue recognition provides greater understanding of situational cues. Do not actively engage decision behaviours or actions.</td>
</tr>
<tr>
<td>Post-mortems, Debriefs, Reflective Practice (eg Lessons Learned)</td>
<td>Can identify successful behaviours to be reinforced and codified in improved procedure and training. Reflection deemed essential to set experiences in memory and facilitate RPD. Do not actively engage decision behaviours or actions.</td>
</tr>
</tbody>
</table>
Summary

- Our research identified five key decision making behaviours used on the fireground.
- Fostering these behaviours is heavily dependent on meaningful experience and requires the development of thinking firefighters through a range of methodologies.
- These behaviours also have implications for organisational values, policy and procedure, and work practices.