



This is a peer-reviewed, post-print (final draft post-refereeing) version of the following published document:

**Catherwood, Dianne F, Sallis, Geoffrey, Edgar, Graham K
ORCID logo ORCID: <https://orcid.org/0000-0003-4302-7169> and
Medley, Andrew (2011) Scoping and Bias in the Fireground: A
new approach to understanding fireground “situation
awareness”. Fire, Januar. pp. 27-29.**

Official URL: <https://www.fire-magazine.com/fire/default.aspx>

EPrint URI: <https://eprints.glos.ac.uk/id/eprint/2510>

Disclaimer

The University of Gloucestershire has obtained warranties from all depositors as to their title in the material deposited and as to their right to deposit such material.

The University of Gloucestershire makes no representation or warranties of commercial utility, title, or fitness for a particular purpose or any other warranty, express or implied in respect of any material deposited.

The University of Gloucestershire makes no representation that the use of the materials will not infringe any patent, copyright, trademark or other property or proprietary rights.

The University of Gloucestershire accepts no liability for any infringement of intellectual property rights in any material deposited but will remove such material from public view pending investigation in the event of an allegation of any such infringement.

PLEASE SCROLL DOWN FOR TEXT.

This is a final draft version of the following published document:

**Catherwood, Dianne F and Sallis,
Geoffrey and Edgar, Graham K and Medley,
Andrew (2011). *Scoping and Bias in the Fireground:
A new approach to understanding fireground
“situation awareness”*. Fire, January 27-29.**

Published in Fire, and available online at:

<https://www.fire-magazine.com/fire/default.aspx>

We recommend you cite the published version.

The URL for the published version is <https://www.fire-magazine.com/fire/default.aspx>

Disclaimer

The University of Gloucestershire has obtained warranties from all depositors as to their title in the material deposited and as to their right to deposit such material.

The University of Gloucestershire makes no representation or warranties of commercial utility, title, or fitness for a particular purpose or any other warranty, express or implied in respect of any material deposited.

The University of Gloucestershire makes no representation that the use of the materials will not infringe any patent, copyright, trademark or other property or proprietary rights.

The University of Gloucestershire accepts no liability for any infringement of intellectual property rights in any material deposited but will remove such material from public view pending investigation in the event of an allegation of any such infringement.

PLEASE SCROLL DOWN FOR TEXT.

Catherwood, D., Sallis, G., Edgar, G., & Medley, A. (2011). Scoping and Bias in the Fireground: A new approach to understanding fireground "situation awareness". *Fire, January, 27-29*

Scoping and Bias in the Fireground:

A new approach to understanding fireground “situation awareness”

Di Catherwood¹, Geoff Sallis^{1*}, Graham Edgar¹, Andrew Medley¹

¹Centre for Research in Applied Cognition, Knowledge, Learning and Emotion (CRACKLE)

(University of Gloucestershire)

*Gloucestershire Fire and Rescue Service

Thanks are due to the Gloucestershire Fire and Rescue Service and to the Avon FRS South West Command Development Centre for their generous assistance with this project.

Scoping and Bias in the Fireground:

A new approach to understanding fireground “situation awareness”

Scoping the fireground. A new approach to understanding how information is taken in and used on the fireground is being developed by staff from the Gloucestershire Fire and Rescue Service and CRACKLE (Centre for Research in Applied Cognition, Knowledge, Learning and Emotion) at the University of Gloucestershire. The research involves observing FRS teams during training exercises to determine how individuals and teams use information about the fireground situation.

The particular interest is how the fireground is “scoped”- that is, whether people work from a broad span of information or focus down on a small part of the available information. This “scoping” can have an external or internal aspect. In an external sense, it can affect the visual inspection of the fireground (people can scan widely or narrowly). In an internal sense, it can affect the mental impression that is formed about the situation (people can think widely about a situation or narrow down on a few aspects). The two aspects are closely linked: for example, a narrow internal scope could lead to incomplete visual inspection of the situation and vice versa, narrow external scanning of a situation could give an incomplete mental picture or impression of the situation.

Scoping may have important consequences for decisions and errors made in actual fireground situations (Catherwood, Edgar, Sallis, Medley, 2010). The ultimate aim of the current project is to improve understanding of how scoping might affect operational command and control decision-making on the incident ground and to develop guidelines for training self-awareness of the “scoping” of information in actual fireground situations.

Background ideas and research. Past research by team members (eg., in regard to military situations: Edgar & Edgar, 2007; Edgar et al., 2009) has shown that individuals differ in how much of the available information that they use and trust in making decisions- referred to as the “bias” or “scope” of the individual. Even when individuals basically have the same knowledge of a situation, they may still vary in how or how much of that information that they actually choose to use in making decisions. Some people may trust or use only a narrow range or scope of available information, while others may be more “lax”, trusting or using a wider scope of information. Even the same person may vary in the scope or bias that they use in different situations.

As noted above, bias or scope can apply to either the external situation (how the situation is scanned) or to internal information (the breadth of the mental impression of the situation used to make decisions). Even if a wide range of information is seen and taken on board and lodged in the mental impression or knowledge about a situation, people can still *mentally or internally* adjust their scope so they can select the points they want to use from the full range available in their knowledge or memory. It is like having a wide-screen TV display of the situation in your mind, but staring at only one part of the screen. This can explain some of the puzzling errors people make even when theoretically they have all the correct knowledge available to them. The full range of information is there in the person’s knowledge, but not necessarily used or noted in actually making decisions.

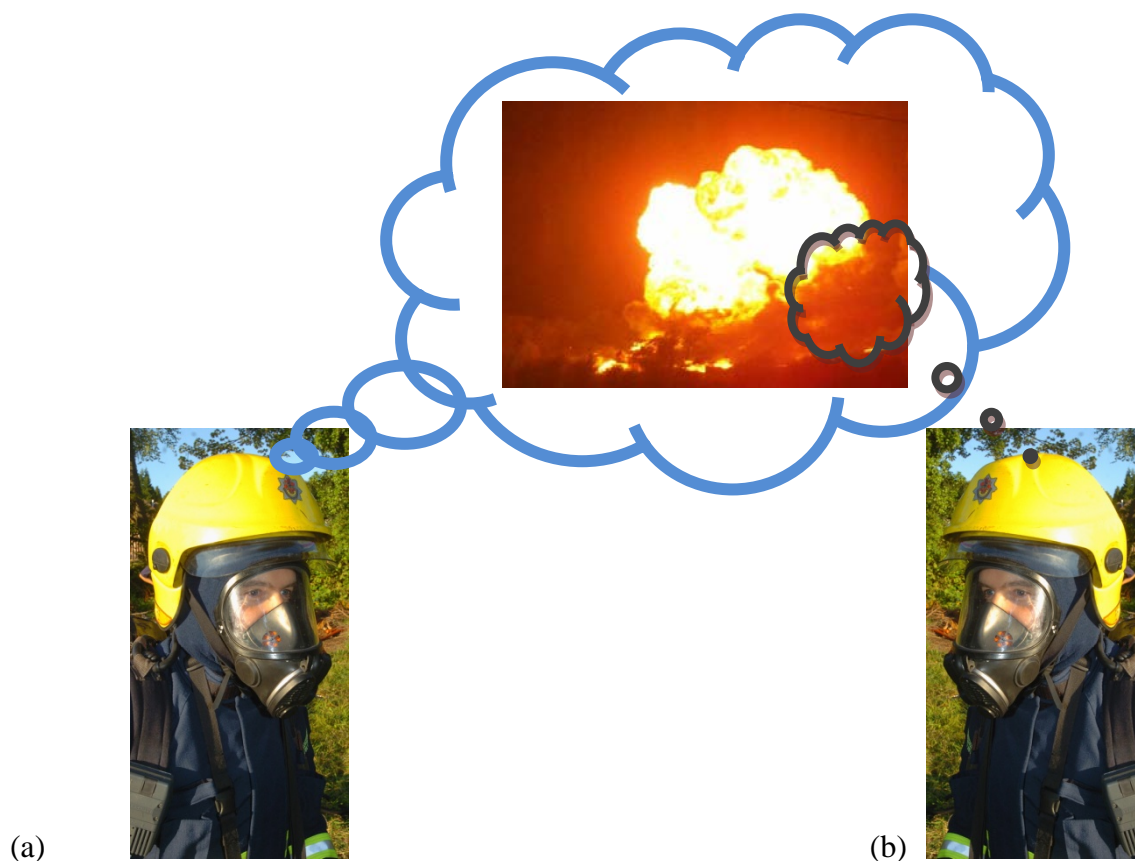


Figure 1: *People vary in the “bias” or “scope” of information used in decision-making: some may have a wide bias (a), others more narrow (b): each approach carries its own risks.*

The Risks. Neither a lax or tight bias or scope is necessarily correct or necessarily wrong. The important thing is to check that the appropriate scope is being used at critical points in appraising the situation. At some points in making decisions, a broad scope may be best while at others a narrower one may be needed. Nonetheless, each has its own dangers. If people apply too narrow a bias or scope, they run the risk of ignoring important aspects of a situation (eg., staring at a tiny burning ember near your feet while the roof is about to collapse on you from above), while having a broad bias or scope may mean very important information is not given any more focus than irrelevant information.

People may have their own personal bias tendencies, but for most people, any sudden and unexpected change in a situation seems to produce a *narrow* bias– so that people restrict their mental focus to what seems important to them in the situation. In general, this can often be a good plan: for example, it seems like a good idea to narrowly focus on a burning roof descending on you from above! But this tendency also carries the risk of overlooking important aspects of the situation that were not expected or predictable (eg., that an exit has now been suddenly blocked) and this is how errors in decision-making can occur in stressful and changeable situations. The ultimate goal of the current research programme is to further the understanding of this tendency in order to support the training of effective fireground decision-making.

The Project so far. To begin, FRS personnel in Minerva and Hydra training exercises were observed and this formed the basis for developing a further study of 16 operational FRS personnel (in 6 teams of 2 or 3 people) during a BA-guideline training exercise (Catherwood, Edgar, Sallis, Medley, 2010). Immediately after the BA exercise, individuals were asked to respond to true-false questions about both briefed and non-briefed aspects of the exercise. An example of the briefed items is: “*You were briefed to search off branch line 2: True/False*”, while an example of a non-briefed items is: “*There were two branch lines in the building: True/False*”.

The responses were then analysed by a method developed by the research team called QASA: (Quantitative assessment of situation awareness). This method takes into account not only the percentage of correct answers (the *knowledge* or “*situation awareness*” score) but also the person’s tendency to say True or False. This gives some idea of the person’s *scope or bias*: at one extreme, a person saying “true” to everything is showing a very lax or broad scope, accepting all the information available to them in an uncritical way, while at the other extreme, a person saying “False” to everything is showing a very restricted scope, only

accepting a narrow range of information as being true or useful and rejecting or overlooking the rest.

Overall the analysis shows that knowledge or situation awareness was good, although predictably it was better for briefed items (average of 88.6% correct) than non-briefed items (average 68.8% correct) - and a non-briefed item (“*There was a gas cylinder outside the building*”) showed the lowest score of all (average 25% correct). Interestingly however the results also show that two people can seem to have similar knowledge but in fact still have a very different scope or bias in regard to that knowledge.

For example two people scored especially well on the knowledge tests: Person A obtaining 88% correct and Person B getting 91% correct, but their scoping or bias scores tell a very different story- one was applying a very narrow scope to the knowledge and the other a much broader scope. Their results are shown in Figure 1: there are two scores shown for each person: a knowledge score in blue (from +100 or 100% correct ranging down to -100 or 100% wrong) and a scoping or bias score in red (also from +100 being very strict to -100 being very lax).

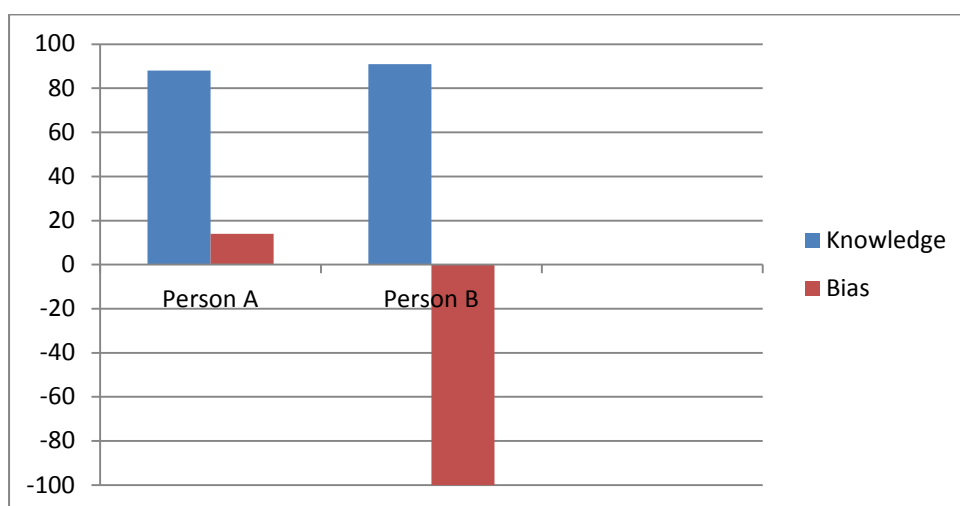


Figure 2. Examples of Results from BA-guideline exercise showing two people with apparently similar good Knowledge scores, but very different Scopes/Biases: Person A having a narrower or stricter bias and Person B a lax or accepting bias.

Person A tends to have a somewhat narrow scope or strict bias, while Person B shows a very broad scope or loose bias, saying “True” not only to the correct items but indeed to many items (including false or wrong items). This shows us that these two people were applying very different filters or scopes to the information: Person A was using a very narrow scope, being cautious in accepting something as true, while Person B was being much less cautious, using a much more lax scope to consider the information.

Implications for training. Both approaches can have their pitfalls: too narrow or strict a scope means you can reject information that is useful and true, while too lax a scope can mean you are using wrong or useless information. As noted above, scope or bias can also shift when there is a sudden increase in the uncertainty of a situation, usually becoming more strict or narrow. For example, a sudden increase in risk level in fireground situations could mean that Person B above may become much stricter in their scoping, narrowing in on the correct items only. But it may also mean that the bias of Person A could become stricter too—with a very narrow scope that misses or overlooks correct information. There may no simple answer about the best level of bias to use. It depends on the demands of the situation to a large extent. However it seems that it would be beneficial to have some means to self-check on personal level of bias or scoping at key points in decision-making and the current project is embarking on further studies to that end.

References

- Catherwood, D., Edgar, G., Sallis, G., & Medley, A. (2010). Scoping the Fireground: the range and bias of information used in decision-making in simulated fireground exercises. *27th International Congress Applied Psychology*, Melbourne, Australia
- Edgar, G., & Edgar, H. (2007). Using Signal Detection Theory to Measure Situation Awareness: The Technique, The Tool (QUASATM), the TEST, the Way Forward. In M. Cook, J. Noyes & Y. Masakowski (Eds.), *Decision making in complex environments* (pp. 373-385). Aldershot, UK: Ashgate.
- Edgar, G. K., Catherwood, D., Nikolla, D., & Alford, C. (2009). Monitoring changes in the spread of spatial attention following loss of situation awareness. *4th International Conference on Spatial Cognition*, University of Rome.