



20 October 2014

Paul Kelly

fyi-request-2044-58d48bb9@requests.fyi.org.nz

Dear Mr Kelly

You have requested to be supplied will all emails and other documentation between Inspector Joe Green and Duncan Ferner of NZSAR as well any staff of LandSAR, Tai Poutini Polytechnic and other interested parties on the topic of probability of detection in search management.

Please find attached the document explaining the Police approach and e mails received as part of the discussion around that approach. Some identifying personal information has been withheld under the privacy grounds of section 9(2)(a) of the Official Information Act 1982.

You have the right, under section 28(3) of the Official Information Act 1982, to ask the Ombudsman to review my decision if you are not satisfied with the way I have responded to your request.

Yours sincerely

Superintendent Barry Taylor
National Manager Response and Operations

"Probability of detection"?

Recommendation:

That New Zealand Police as a SAR coordinating authority do not support the inclusion of 'probability of detection' as a mathematical equation in the Formal Search Planning Guidelines.

1. NZ LandSAR are preparing Formal Search Planning Guidelines. This includes the 'measurement of probability of detection' as a mathematical probability.
2. The completion of the Formal Search Planning Guidelines is dependent on the Police as SAR coordinating authority forming a view on the inclusion of probability of detection as a mathematical equation.
3. Probability of detection is defined as "the probability that the specific sensor (searcher) moving in the way they did, would find the specified object, given that the object is in the area and visible". It is translated for land searches as "if there were 100 clues in the area you searched, how many do you think you would have found". From this a % is derived.
4. Probability of detection is based on the object being searched for being in the area. If it isn't in the area it of course cannot be found and probability of detection as a mathematical equation is totally meaningless.
5. Considerable research has been done on probability of detection. One, Cibola SAR (www.cibolasar.org/minilessons/SearchTheo.shtml) reports the "the standard land SAR meaning is subjective and essentially meaningless from a mathematical stand point and useless in planning", and, "bears little relation to the actual probability of finding the object".
6. This is not to say that the controller of a search should not interview and debrief field teams to determine how thoroughly they searched. Young and Wehbring, the authors of *Urban Search*, use the term "probability of detection" in this way. They warn of the unreliability of volunteer searchers in determining probability of detection.
7. There is considerable doubt as to the validity of probability of detection as a mathematical equation.
8. This is exacerbated when the math equation is used to determine some sort of "probability of success" - the % that a search is likely to have been successful (if the object were in the area). This type of flawed math, described as "highly doubtful statistically" with an outcome of questionable validity in the land search environment, has the potential to put Police, as a SAR coordinating authority at risk.
9. Given these factors, I recommend that NZ Police as a SAR coordinating authority do not support the inclusion of 'probability of detection' as a mathematical equation in the Land Formal Search Planning Guidelines.
10. Probability of detection is used in marine searches. It is valid within this environment and this paper does not address this (nearly all google responses relate to marine search).

Joe Green
Inspector
Relieving Manager Emergency Management

GREEN, Joseph (Joe)

From: GREEN, Joseph (Joe)
Sent: Monday, 14 April 2014 07:52
To: [REDACTED]
Subject: POD paper
Attachments: Probability of detection.doc

As discussed.

Cheers

Joe Green

Inspector

Manager Arms Control and Relieving Manager Emergency Management

GREEN, Joseph (Joe)

From: GREEN, Joseph (Joe)
Sent: Thursday 7 November 2013 10:49
To: [REDACTED]
Subject: FW: SARINZ Newsletter POD article
Attachments: POD Pages from HeadsUp Nov 2013.pdf

I am trying to get a handle on this.

Is this worthy of a response? How do SARINZ fit into the current NZ SAR scene.

Cheers

Joe

From: [REDACTED]
Sent: Thursday, 7 November 2013 10:32
To: GREEN, Joseph (Joe)
Subject: SARINZ Newsletter POD article

Greetings Inspector Green,

I wanted to write and provide you with advanced notice of an article addressing the recent decision on POD which will be distributed nationwide tomorrow.

As you will see from reading the article, we do support many of the statements made in the email that was circulated, and have in fact been making many similar statements since 2009/2010.

Our greatest concern, as outlined in the article, is the information upon the decision to ignore POD is based. The website referenced, and the papers upon which the website author has based their opinions are all pre 2004. We are concerned that none of the 2004-2013 POD research has been taken into account to obtain an objective opinion.

As stated in your email: Probability of detection is defined as "the probability that the specific sensor (searcher) moving in the way they did, would find the specified object, given that the object is in the area and visible". It is translated for land searches as "if there were 100 clues in the area you searched, how many do you think you would have found". From this a % is derived.

Unfortunately due to political decisions, NZ has failed to move with international best practice. The second sentence has been proven through numerous amounts of research to be entirely inaccurate. This has been advised to the NZ SAR sector on numerous occasions, but as a sector the outdated and wrong interpretation has remained in use. No modern SAR organisation uses this definition for search planning.

As you do identify, POD does work in the maritime SAR environment. We advocate that it does work in the land SAR environment IF applied appropriately using the same methodology. All post 2006 research supports this.

Our position is not critical of the Police decision. We are critical that appropriate and current information was not made available to you.

If you are interested in being shown how POD should be applied to the land search process we would be more than happy to demonstrate it.

Hopefully this is not seen as a personal attack or an attack on the Police as we have the highest regard for

the NZ Police and the work undertaken by the Police. I did want to ensure that you received the article in advance and were not blind-sided by it upon its release.

Best regards.

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SEARCH AND RESCUE INSTITUTE NEW ZEALAND

"helping others save lives"

The information contained in this email is intended only for the addressee and is not necessarily the official view or communication of SARINZ.

If you are not the intended recipient you must not use, disclose, copy, distribute or store this message or information in it.

If you have received this message in error, please email or telephone the sender immediately and delete the message

GREEN, Joseph (Joe)

From: GREEN, Joseph (Joe)
Sent: Thursday, 7 November 2013 11:27
To: [REDACTED]
Subject: FW: SARINZ Newsletter POD article
Attachments: POD Pages from HeadsUp Nov 2013.pdf

[REDACTED] this article to run in the SARINZ newsletter. It is generally disparaging of SAR training and our policy approach to probability of detection (which you may recall we discussed and decided not to use as a mathematical equation. Not only do I not think it workable, it places police at risk – what if the % came out at 50%, and we hadn't found the person!

I think this part of the politics of SAR where SARINZ is in conflict with LandSAR and Tai Poutini Polytech.

I met with [REDACTED] from LandSAR last week and he is leading a project to develop a process whereby search teams can evaluate the likelihood of finding a person in area given terrain, etc, etc.

This is what [REDACTED] said in his e mail invite yesterday:

As you are aware the Police have determined that the use of POD expressed as a percentile to evaluate search effort is not working here in New Zealand – a position I personally agree with.

Just a heads up. I am not responding to SARINZ – if they wanted a response they should have approached me before writing the article.

Joe

From: [REDACTED]
Sent: Thursday, 7 November 2013 10:32
To: GREEN, Joseph (Joe)
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POD - Fact or Fiction?

SARINZ received many email's and phone calls regarding the decision by the Police to disregard Probability of Detection (and thus POS) in land search planning. We considered our options carefully, and determined that it was best to wait until the emotional response had ended. The email sent by Inspector Green did not come as a surprise, at least to anyone who really understands POD and the research papers which the website author has used as the key references and thus have ultimately influenced Inspector Green's decision.

Based on the evidence from which the decision was made, Inspector Green has reached the only logical conclusion.

Many of the points made in Inspector Green's email are the EXACT same points that SARINZ has been making for several years. We have been lobbying for change in the reporting of POD and have undertaken research to develop scientific based alternatives. Tasman Search and Rescue and the Tasman Police, in particular Sherp Tucker and Inspector Hugh Flower have been instrumental in driving an improved POD reporting process.

There is ZERO correlation between how well a search resource "believes" it has searched an area and its actual performance.

This comment was originally made at the 2004 (Hopuhopu) and the 2006 (Dunedin) LandSAR Conference by Robert Koester when presenting on POD developments in the USA - and referencing the same papers upon which Inspector Green's decision has been made. This position was again reiterated by SARINZ at the 2010 LandSAR Conference in Hokitika when presenting the sound and light detection index (POD) findings. A selection of the PowerPoint slides used in the 2010 presentation appear at right.

All of the research based evidence from 2001 to the present day tells us that we should not be asking search resources to report search effectiveness as a POD %.

SARINZ had the privilege whilst being in the US earlier this year to read and review a number of research papers concerning detection and the changes occurring in POD around the world. Whilst these papers are yet to become public, some of these changes have already been incorporated into our training materials and have already been taught in NZ. Appropriately knowledgeable instructors can teach field personnel to establish a research based POD for visual search.

Establishing a scientific POD for visual search is an incredibly simple process, requiring minimal computation and a simple graph, but in NZ, POD has been made out to be some complicated advanced mathematical process by so called "experts" that simply should have known better.

The reporting of POD in NZ is very misunderstood. Whilst the function of detection is a field search task, POD (%) is a search planning calculation. Field teams should not be expected to report their POD as a percentage. As taught in the SARINZ Search Methods course, being asked to report the number of objects you would likely have found converted to a percentage is a fundamentally flawed question. The question in its basic sense is asking a resource to analyse what it did NOT find - thus the balance is the chance that they would have detected the subject/object had it been in the area. How can any resource be expected to report what it did NOT find?

This argument is the basis of Inspector Green's decision to disregard the use of POD. And he is 100% correct IF this process is used.

Search theory is completely dependent upon an accurate assessment of how well a search area was covered. Fortunately extensive operations research has determined the factors needed to determine a meaningful probability of detection. Key to the formula for an objective probability of detection is the effective sweep width or detection index. The detection

Slide 2

Why bother?

- Good question!
- Traditional SAR theory $POA \times POD = POS$
- POD has only ever been a "best guess"
- How can we improve formal search planning with only having half of the information?
- Lead to better understanding of how to allocate resources in future SAR operations
- Other options for POD trials being considered appeared ad-hoc and lacked scientific validity

Slide 3

Current international thinking on POD

"A searcher is a reliable source of information on the search environment... and his/her physical condition, training, experience...[etc] However the only direct detection information the searcher can reliably report is what objects they detected... and where and when they were detected..."

Searchers should... report only what they can observe; search planners should estimate POD values based on those observations and the results of detection experiments"

Slide 4

Current international thinking on POD

Koopman (1980) described three basic pitfalls to avoid when studying an operation with a view toward improving it.

1. Focusing primarily on basic sensing capabilities without sufficient emphasis on how to use or deploy the available sensors to maximum effect in a search.
2. Trying to provide practical search planning guidance without first obtaining the scientific background necessary to provide sound guidance.
3. Inappropriate handling of the mathematics by either trying to eliminate it altogether, thus eliminating much of the reasoning essential to providing practical advice, or by going to the other extreme and elaborating it to a degree of generality not required by either the theory or the practice of searching

Slide 38

Key Findings

- It is possible to obtain a detection index for sound (whistles)
- First reported detection index for light
- Experiments conducted for relatively low cost
- Correction factors need to be established
 - Wind, Hearing, Background sound

Slide 44

So where are we heading...

- A search team only having to report the tangible factors of:
 - What technique they used
 - What the vegetation conditions are
 - Background noise level
 - Wind conditions
 - Weather conditions etc etc
- A scientifically field tested POD can then be established for that task

index takes into account the nature of the sensor (hearing and seeing ability of the searcher), the environmental conditions, and the search object. The only direct information the searcher can reliably report is: what search technique they used, the environmental conditions (weather, background noise, vegetation etc.) as well as what objects they actually detected and where and when they were detected. This is 2010 knowledge.

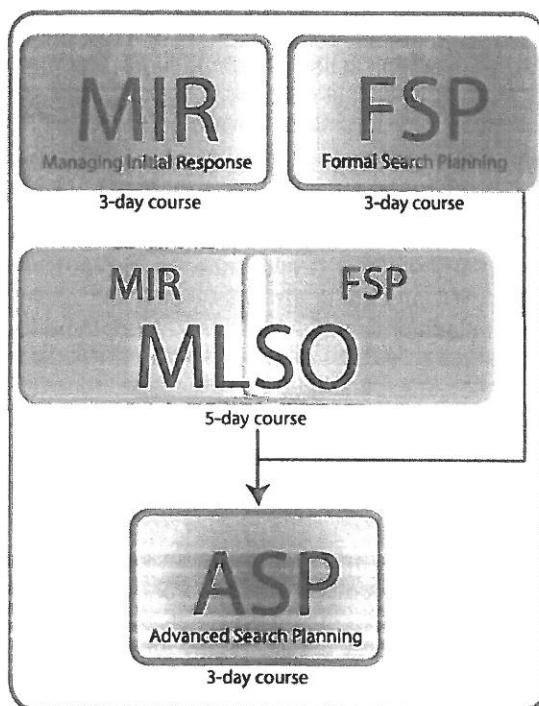
Search planners should establish POD values based on those observations and the results of detection experiments to establish a detection index.

This process is the world standard, and has been for a number of years. Modern search practice gives consistent and scientifically valid POD values from which POS values can also be established.

It is ultimately envisaged a comprehensive set of tables would be developed so that the planning team could establish a POD. Whilst there will always be a small amount of variability, this POD will be much more accurate than current "best guess" methods.

Several things need to happen in the short term to bring our knowledge on par with current international best practice.

1. Those responsible for overseeing training and policy decisions need to realise that they are being short-changed by their so-called "experts". Due to decisions to remove licenced material and promote internal development, land search planning is stuck circa 2007 at best.
2. Search management is NOT search planning. Search management, including the SARINZ Managing Land Search Operations (MLSO) course provides an overview of the search management processes for all members of an IMT. In the last 5 years, and the last two years in particular, there have been numerous developments in search planning and POD. Search planning is a specialist task and needs to be treated as such through educating and developing specialist search planners.
3. The urgent inclusion of *current* international field search practices into core field searcher training to provide them with the skills and knowledge to establish their own detection index. This will be needed until such time as the research and POD tables are complete.
4. Selected implementation of the visual detection experiments in NZ conditions to confirm the applicability of the data tables.
5. Investment in research to complete the sound and light detection index trials and establish the correction factors.



It is a pity that there appears to be a lack of technical expertise by those that are tasked with providing assistance or guidance to senior policy decision makers. It is a greater pity that the current political climate imposes on Police and SAR volunteers training that does not reflect current international best practice and thus they are required to often make decisions based on outdated information. This is compounded by the self-appointed "search experts" that are influencing these types of decisions.

Had Inspector Green received better technical advice his decision would likely have been different.

The advocacy of formal search planning without the inclusion of formal search theory is farcical. The only rationale for this is an attempt to justify why best practice formal search planning has not been available to the land SAR sector for nearly five years. NZ accepts that search theory works in the marine environment where search theory is applied appropriately. Search theory is proven to work in the land SAR environment when it is applied APPROPRIATELY.

To not use POD due to inappropriate use is justifiable, but the stronger outcome would be to ensure the inclusion of POD with the *appropriate* application.

When applied appropriately POD is both factual and meaningful.

Until such time as the experiments are complete, there are still plenty of international best practices which can be used to determine more valid POD than the antiquated "best-guess" method. Given the amount of research data available, improvements in search processes and the research underway, it is impossible to determine any valid reasons why POD should not be included in the formal search planning guidelines.

Interested in learning more? Email info@sarinz.com and we can email you some of the publicly available research papers or arrange a demonstration of the appropriate application of POD.

GREEN, Joseph (Joe)

From: GREEN, Joseph (Joe)
Sent: Thursday, 4 July 2013 08:25
To: [REDACTED]
Cc: [REDACTED]
Subject: RE: Probability of Detection

The paper came out of the course last week, which included all experienced police SAR people.

The issue is with POD as some form of quasi mathematical equation. I've read a considerable amount of the research now and it isn't really supported in terms of land searches, and I couldn't apply it to the NZ bush.

We do need to have a process to debrief teams, but not turning that to a mathematical equation. We suggest using a term other than POD (though the authors use it in the sense that I see it).

Joe

From: [REDACTED]
Sent: Wednesday, 3 July 2013 09:03
To: GREEN, Joseph (Joe); [REDACTED]
Cc: [REDACTED]
Subject: Probability of Detection

Hi Joe and [REDACTED]

[REDACTED] as passed on to me the Police's recommendation as regards the inclusion of the 'probability of detection (POD)' calculations in the formal search planning guidelines that will be used to inform the on-going development of the TPP Formal Search Planning course.

At this stage it is probably worth noting that the current formal search planning guidelines were developed collaboratively between LandSAR and senior Police SAR Coordinators (5 of each as I recall) – so very much a joint effort – and whilst I don't necessarily disagree with the rationale for the recommendation I believe there needs to be further consideration – in particular about the following matters:

- Given that the former Managing Land Search Operations (MLSO) course, on which all of our formal search planning processes are based, is the search management standard in terms of internationally recognised best practice in 9 countries including the US, Canada, UK, South Africa, Sweden, Australia and others – what are the ramifications here in NZ if we head off in a different direction. This should also take into account the possibility that some detractors (without mentioning names) here in NZ could use this for political or commercial gain through either the media or the Corner's Courts or elsewhere and how that would impact on our respective organisations
- And if we do abandon the concept of POD as a mathematical evaluation of search effort what formal search planning processes are developed to fill the gap – what do we do instead

I also think there needs to be some thinking around other ways to determine POD which is occurring overseas – such as coverage and sweep widths based on realistic POD field trials – a far more objective process that seems to have more merit and which has already commenced here in NZ

I would like to meet shortly to discuss this recommendation further and consider where to from here as a sector – I am very happy to travel to Wellington to catch up with you guys – can you perhaps suggest some dates when it would suit you.

Cheers

[REDACTED]

SEARCH & RESCUE
LAND SAR
NEW ZEALAND

facebook

Name:
LandSAR New
Zealand



GREEN, Joseph (Joe)

From: GREEN, Joseph (Joe)
Sent: Thursday, 4 July 2013 08:11
To: [REDACTED]
Subject: RE: Probability of detection

Done.

Joe

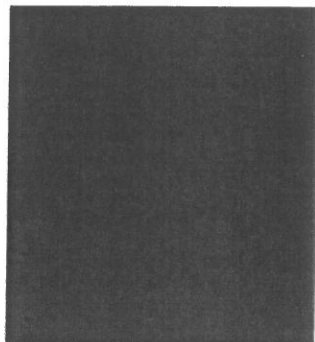
From: [REDACTED]
Sent: Tuesday, 2 July 2013 15:09
To: GREEN, Joseph (Joe)
Subject: RE: Probability of detection

Joe

Thanks. I note that you refer to the Marine POD in point 10 however and at the risk of being pedantic, should your "Recommendation" read:

That New Zealand Police as a SAR coordinating authority do not support the inclusion of 'probability of detection' as a mathematical equation in the Land Formal Search Planning Guidelines.

Regards



From: GREEN, Joseph (Joe)
Sent: Tuesday, 2 July 2013 11:39
To: [REDACTED]
Subject: Probability of detection

As promised last week I have canvassed the use of probability of detection as a mathematical equation.

New Zealand Police as a SAR coordinating authority do not support the inclusion of probability of detection as a mathematical equation.

I have attached the paper supporting this decision.

Joe Green

Inspector

B.A. (Hons), Dip.Bus.Stud., T.T.C

Diploma in Outdoor Leadership

Relieving Manager: Emergency Management

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Sent: Tuesday, 2 July 2013 11:39
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