

# Notes

## Chapter One

1.  $POA \times POD = POS$  (probability of area (POA) times probability of detection (POD) equals probability of success (POS)). POA, the term used in the land SAR community, is identical to probability of containment (POC), the term used in maritime SAR.
2. Dennis Kelley and Rex Farquhar used the term “P(A) = Probability that the victim is actually in A” in 1973. This is the early origin of POA in the land SAR community.
3. LaValla, Patrick (Rick), Robert (Skip) Stoffel, B. Wade, J. Brady. 1985. *Search is an emergency: Text for managing the search function*. Tacoma, WA: Emergency Response Institute.
4. Koopman, Bernard. 1946. *Search and screening*. Washington, DC: Operations Evaluation Group, Office of the Chief of Naval Operations, U.S. Navy.
5. Jack Frost, e-mail message to author, March 3, 2008.
6. Heth, Donald and Ed Cornell. 1997. Characteristics of travel by persons lost in Albertan wilderness areas. *Journal of Environmental Psychology* 18:223-235.
7. Barbara Adcock, e-mail message to author, May 2008.
8. Concept of what is lost from Hill, Kenneth. 1999. *Lost person behaviour*. Ottawa: National Search and Rescue Secretariat.
9. Hill, Kenneth. 1999. *Lost person behaviour*. Ottawa: National Search and Rescue Secretariat.
10. Setnicka, Tim. 1980. *Wilderness search and rescue*. Boston: Appalachian Mountain Club. Please contact author if any earlier written record is known.
11. Kelley, Dennis. 1973. *Mountain search for the lost victim*. Montrose, CA: Privately published.
12. Survival Time Software.
13. Syrotuck, William. 1975. *An introduction to land search: Probabilities and calculations*. Mechanicsburg, PA: Barkleigh Productions, Inc.
14. Syrotuck, William. 1976. *Analysis of lost person behavior: An aid to search planning*. Mechanicsburg, PA: Barkleigh Productions, Inc.
15. Stoffel, Robert. 2006. *The textbook for managing land search operations*. Cashmere, WA: ERI Publications & Training.
16. National Association for Search & Rescue. 2001. *Search and rescue operations field guide*. Chantilly, VA: National Association for Search & Rescue.
17. LaValla, Patrick. 1999. *Search is an emergency*. Olympia, WA: ERI International.
18. Mitchell, Barry. 1985. A summary of the National Association for Search and Rescue data collection and analysis program for 1980–1985. *Response 85—National Association for Search and Rescue Conference Proceedings*. Chantilly, VA: National Association for Search and Rescue.
19. Hill, Kenneth. 1991. Predicting the behavior of lost persons. *Response 91—National Association for Search and Rescue Conference Proceedings*. Chantilly, VA: National Association for Search and Rescue.
20. O’Connor, Daniel, ed. 2007. *Managing the lost person incident*. Chantilly, VA: National Association for Search and Rescue.
21. Cornell, Ed and Kenneth Hill. 2005. The problem of lost children. Chapter to appear in *Children and Their Environments: Learning, Using, and Designing Spaces*, C. Spencer and M. Blades, eds., 26-41. Cambridge, UK: Cambridge University Press.
22. Hill, Kenneth. 2005. *Lost and found: Analysis of lost person behavior*. Paper presented at the annual Washington State Search and Rescue Conference, Leavenworth, WA.

23. Koester, Robert J. and David Stooksbury. 1992. Lost Alzheimer's subjects: Profiles and statistics. *Response: The Journal of the National Association for Search and Rescue* 11(4):20-26.
24. Koester, Robert J. 1998. The lost Alzheimer's and related disorders subject: New research and perspective. *Response 98—National Association for Search and Rescue Conference Proceedings*. Chantilly, VA: National Association for Search and Rescue.
25. Kelly, Kimberly, Robert J. Koester, and Michael St. John. 2007. Missing person behavior. In *Urban Search: Managing Missing Person Searches in the Urban Environment*, Christopher S. Young and John Wehbring, 153-249. Charlottesville, VA: dbS Productions.
26. Koester, Robert J. 2006. Missing and lost person behavior. In *The Textbook for Managing Land Search Operations*, Robert Stoffel, 189-229. Cashmere, WA: Emergency Response International, Inc.
27. Koester, Robert J. and Charles Twardy. 2006. New Zealand missing person behaviour. technical report. Lecture presented at the New Zealand Land SAR Conference, Dunedin, New Zealand. <http://www.sarbayes.org>.
28. ———. 2006b. Washington State missing person behavior. Technical report. Lecture presented at the Washington State SAR Conference, Enumclaw, WA. <http://www.sarbayes.org>.
29. Cornell, Ed and Donald Heth. 1996. Distance traveled during urban and suburban walks led by 3-to 13-year-olds. *Response: The Journal of the National Association for Search and Rescue* 9(4):22-26.
30. Cornell, Ed, Donald Heth, and D. M. Alberts. 1994. Place recognition and way finding by children and adults. *Memory & Cognition* 22:537-542.
31. Cornell, Ed and Donald Heth. 2000. Route learning and wayfinding. In *Cognitive Mapping: Past, Present and Future*, R. Kitchin & S. Freundschuh, eds. London: Routledge.
32. Cornell, E., A. Sorenson, and T. Mio. 2003. Human sense of direction and way finding. *Annals of the American Association of Geographers* 93:402-428.
33. Cornell, E., D. Heth, Y. Kneubuhler, and S. Sehgal. 1996. Serial position effects in children's route reversal errors: Implications for police search operations. *Applied Cognitive Psychology* 10:301-326.
34. Heth, Donald and Ed Cornell. 2006. A geographic information system for managing search for lost persons. In *Applied Spatial Cognition: From Research to Cognitive Technology*, G. Allen, ed. Mahwah, NJ: Lawrence Erlbaum Associates.
35. Perkins, Dave, Pete Roberts, and Ged Feeney. 2003. *Missing person behaviour: An aid to the search manager*. Northumberland, UK: Centre for Search Research. <http://www.searchresearch.org.uk>. Accessed May 2008.
36. Perkins, Dave, Pete Roberts, and Ged Feeney. 2005 *The U.K. missing person behaviour study*. Northumberland, UK: Centre for Search Research. <http://www.searchresearch.org.uk>. Accessed May 2008.
37. Twardy, Charles, Robert Koester, and Rob Gatt. 2006. *Missing person behaviour: An australian study*. Technical Report to Australian National SAR Council.
38. Gibb, Graham and Penny Woolnough. 2007. Missing persons: Understanding, planning, responding. Aberdeen, United Kingdom: Grampian Police.
39. Ela, G. 2004. Epidemiology of wilderness search and rescue in New Hampshire, 1999-2001. *Wilderness and Environmental Medicine* 15:11-17.
40. Adams, A. et al. 2007. Search is a time-critical event: When search and rescue missions may become futile. *Wilderness and Environmental Medicine* 18:95-101.
41. Oregon Emergency Management. 2007. Search and Rescue Report for 2006. [http://www.oregon.gov/OOHS/OEM/tech\\_resp/sar\\_docs/annual\\_sar\\_report\\_2006.pdf](http://www.oregon.gov/OOHS/OEM/tech_resp/sar_docs/annual_sar_report_2006.pdf).

42. Kramer, John. 1999. A guide to urban searches. Raleigh, North Carolina: Privately printed.
43. Bruce, Anne and Richard Rosewarne. 1998. Wandering behaviour in dementia. Melbourne: Victoria Government Department of Human Services.
44. Silverstein, Nina M. and Terry Salmans. 1996. *He comes back eventually...wandering behavior in community residing persons with Alzheimer's disease registered with Safe Return*. Boston: Gerontology Institute, University of Massachusetts.
45. Cooper, Donald C., Patrick LaValla, and Robert Stoffel. 1995. Search and rescue. *Wilderness Medicine: Management of Wilderness and Environmental Emergencies*, P. S. Auerbach ed., 504-534. St. Louis, MO: Mosby-Year Book.

## Chapter Two

1. Syrotuck, William. 1976. *Analysis of lost person behavior: An aid to search planning*. Mechanicsburg, PA: Barkleigh Productions, Inc.
2. Mitchell, Barry. 1985. A summary of the National Association for Search and Rescue data collection and analysis program for 1980–1985. *Response 85—National Association for Search and Rescue Conference Proceedings*. Chantilly, VA: National Association for Search and Rescue.
3. Heth, Donald and Ed Cornell. 1997. Characteristics of travel by persons lost in Alibertan wilderness areas. *Journal of Environmental Psychology* 18:223-235.
4. Koester, Robert J. 1998. The lost Alzheimer's and related disorders subject: New research and perspective. *Response 98—National Association for Search and Rescue Conference Proceedings*. Chantilly, VA: National Association for Search and Rescue.
5. Bailey, Robert. 1995. Description of the Ecoregions of the United States. 2nd ed., revised. Misc. Publication No. 1391. Washington, DC: United States Department of Agriculture.
6. Hill, Kenneth. 1999. *Lost person behaviour*. Ottawa: National Search and Rescue Secretariat.
7. Koester, Robert J. and David Stooksbury. 1992. Lost Alzheimer's subjects: Profiles and statistics. *Response: The Journal of the National Association for Search and Rescue* 11(4):20-26.
8. Perkins, Dave, Pete Roberts, and Ged Feeney. 2003. *Missing person behaviour: An aid to the search manager*. Northumberland, UK: Centre for Search Research. <http://www.searchresearch.org.uk>. Accessed May 2008.
9. Twardy, Charles, Robert Koester and Rob Gatt. 2006. *Missing person behaviour: An australian study*. Technical Report to Australian National SAR Council. <http://sarbayes.org/natsar.pdf>. Accessed May 2008.

## Chapter 3

1. Golledge, R. G. and G. Rushton, eds. 1976. *Spatial choice and spatial behavior*. Columbus, Ohio: Ohio State University Press.
2. Colwell, Martin. 1997. Trail-based probability of area: A terrain-based approach to POA estimation. *Response: The Journal of the National Association for Search and Rescue* 15(4):7-13. <http://www.sarinfo.bc.ca/Trailpoa.htm>.
3. Heth, Donald, Ed Cornell, and G. Dostatni. 2006. Mobile geographic information display for urban search and rescue and disaster management. *Proceedings of First International Workshop on Mobile Geospatial Augmented Reality, Banff, Canada*. [http://regard.crg.ulaval.ca/proceedings/06-heth\\_et\\_al.pdf](http://regard.crg.ulaval.ca/proceedings/06-heth_et_al.pdf).
4. First Response Incident Command System software.
5. SAR Technology, Incident Commander Pro software.
6. The subject in fact moved downhill and followed the main drainage. He was found along the drainage just beneath the first "a" in the word "national" on the map. As it turns out, the evacuation team was sent to the second "a" in "national." But that is another story.

7. John Martin Dervå, e-mail message to author, January 22, 2007.
8. Sedlak, Andrea J., et al. 2002. U.S. Department of Justice. *National estimates of missing children: An overview*. Washington, DC: Office of Juvenile Justice and Delinquency Prevention, Office of Justice Programs, U.S. Department of Justice. <http://www.ncjrs.gov/pdffiles1/ojjdp/196465.pdf>. Accessed May 2008.
9. Sedlak, Andrea, David Finkelhor, and Heather Hammer. 2005. *National estimates of children missing involuntarily or for benign reasons*. Washington, DC: Office of Juvenile Justice and Delinquency Prevention, Office of Justice Programs, U.S. Department of Justice. <http://www.ncjrs.gov/pdffiles1/ojjdp/206180.pdf>. Accessed May 2008.
10. Barbara Adcock, e-mail message to author, November 22, 2007.

#### Chapter 4

1. Young, Christopher S. and John Wehbring. 2007. *Urban search: Managing missing person searches in the urban environment*. Charlottesville, VA: dBs Productions.
2. Hill, Kenneth. 1991. Predicting the behavior of lost persons. *Response 91—National Association for Search and Rescue Conference Proceedings*. Chantilly, VA: National Association for Search and Rescue.
3. Syrotuck, William. 1976. *Analysis of lost person behavior: An aid to search planning*. Mechanicsburg, PA: Barkleigh Productions, Inc.
4. Hill, Kenneth. 1997. *Managing the lost person incident*. Chantilly, VA: National Association for Search and Rescue.
5. Kelley, Dennis. 1973. *Mountain search for the lost victim*. Montrose, CA: Privately published.
6. Twardy, Charles, Robert J. Koester, and Rob Gatt. 2006. *Missing person behaviour: An Australian study*. Technical report to Australian national SAR council. <http://www.sarbayes.org/natsar.pdf>.
7. Koester, Robert J. and Charles Twardy. 2006. New Zealand missing person behaviour technical report. Lecture presented at the New Zealand Land SAR Conference, Dunedin, New Zealand. <http://www.sarbayes.org>.
8. ———. 2006b. Washington State missing person behavior technical report. Lecture presented at the Washington State SAR Conference, Enumclaw, WA. <http://www.sarbayes.org>.
9. Koester, Robert J. 1998. The lost Alzheimer's and related disorders subject: New research and perspective. *Response 98—National Association for Search and Rescue Conference Proceedings*. Chantilly, VA: National Association for Search and Rescue.
10. Chi-square analysis  $p < 0.05$ .
11. Males account for 66.9% of despondents (ISRID data).
12. The fatality rate for despondents is 40% when combining no trace (ISRID data).
13. United States Center for Disease Control. National Data on Deaths by Cause. <http://www.cdc.gov>. Accessed on December 2, 2004.
14. Hill, Kenneth A. 1992. Analyzing scenarios in land search. *Response: The Journal of Search, Rescue and Emergency Response* 11:23-34.
15. Hill, Kenneth A. 1997. Biases in judgements of probability of area. Paper presented at National Association for Search and Rescue Conference, Richmond, VA.
16. Mitchell, Barry. 1985. A summary of the National Association for Search and Rescue data collection and analysis program for 1980–1985. *Response 85—National Association for Search and Rescue Conference Proceedings*. Chantilly, VA: National Association for Search and Rescue.
17. Twardy Charles and Rob Gatt. 2003. Missing behaviour report: An Australian study preliminary report. <http://www.sarbayes.org>.
18. Ken Hill, e-mail message to author, April 2, 2008.

## Chapter 5

1. Hill, Kenneth, et al. 1993. Spatial orientation skills of hunters in forested environments. Paper presented at the annual meeting of the American Psychological Association, Toronto, August 1993.
2. Angier, B. 1956. *How to stay alive in the woods*. New York: Collier Books.
3. Brown, T. 1983. *Tom Brown's field guide to wilderness survival*. New York: Berkeley Books.
4. Fleming, J. 1994. *Staying found*. Seattle, WA: The Mountaineers.
5. Roberts, H. 1988. Staying found. *Backpacker* 16(6):32.

## Chapter Six

1. Scharine, A. and M. McBeath. 2002. Right-handers and Americans favor turning to the right. *Human Factors* 44(1):248-256.
2. Hardyck, C. and L. F. Petrinovich. 1977. Left-handedness. *Psychological Bulletin* 84:385-404.
3. Koester, Robert J. 1998. The lost Alzheimer's and related disorders subject: New research and perspective. *Response 98—National Association for Search and Rescue Conference Proceedings*. Chantilly, VA: National Association for Search and Rescue.
4. Silverstein, Nina M. and Terry Salmons. 1996. *He comes back eventually...wandering behavior in community residing persons with Alzheimer's disease registered with Safe Return*. Boston: Gerontology Institute, University of Massachusetts.
5. Syrotuck, William. 1976. *Analysis of lost person behavior: An aid to search planning*. Mechanicsburg, PA: Barkleigh Productions, Inc.
6. Widmer, C. 1927. Die Desorientierung in den Bergen. *Die Alpen* Bern 3:218-32.
7. Gatty, H. 1983. *Finding your way on land or sea*. Brattleboro, VT: Stephen Greene Press.
8. Mach, E. 1897. Ueber Orientierungsempfindungen. *Schr. Var. Verbr. Naturw. Kenntn.* 37.
9. Howard, I. P. and W. B. Templeton. 1966. *Human spatial orientation*. New York: Wiley.
10. Lund, F. 1930. Physical asymmetries and disorientation. *American Journal of Psychology* 42:51-62.
11. Beattie, P., et al. 1990. Validity of derived measurements of leg-length differences obtained by use of a tape measure. *Physical Therapy* 70(3):150-157.
12. Hill, Kenneth. 1999. *Lost person behaviour*. Ottawa: National Search and Rescue Secretariat.
13. Heth, Donald and Ed Cornell. 1997. Characteristics of travel by persons lost in albertan wilderness areas. *Journal of Environmental Psychology* 18:223-235.
14. Mitchell, Barry. 1985. A summary of the National Association for Search and Rescue data collection and analysis program for 1980-1985. *Response 85—National Association for Search and Rescue Conference Proceedings*. Chantilly, VA: National Association of Search and Rescue.
15. Koester, Robert J. 1998. The lost Alzheimer's and related disorders subject: New research and perspective. *Proceedings of the Annual Conference of the National Association for Search and Rescue*. Chantilly, VA: National Association for Search and Rescue.
16. Twardy, Charles, Robert J. Koester, and Rob Gatt. 2006. *Missing person behaviour: An Australian study*. Technical report to the Australian national SAR council. <http://www.sarbayes.org/natsar.pdf>.
17. Perkins, David, Peter Roberts, and Ged Feeney. 2003. *Missing person behaviour: An aid to the search manager*. Northumberland, UK: Centre for Search Research.
18. Koester, Robert and Charles Twardy. 2006b. Washington State missing person behavior technical report. Lecture presented at the Washington State SAR Conference, Enumclaw, WA. <http://www.sarbayes.org>.

19. Perkins, Dave and Pete Roberts. 1998. Establishing the search area. *Response 98—National Association for Search And Rescue Conference Proceedings*. Chantilly, VA: National Association for Search and Rescue. <http://www.searchresearch.org.uk>. Accessed May 2008.
20. Koopman, Bernard. 1946. *Search and screening*. Washington, DC: Operations Evaluation Group, Office of the Chief of Naval Operations, United States Navy.
21. International Maritime Organization and International Civil Aviation Organization (IMO/ICAO). 1999. *International aeronautical and maritime search and rescue manual, Vol. II: Mission co-ordination*. London/Montreal: The International Maritime Organization and the International Civil Aviation Organization.
22. National Search and Rescue School. 2006. *Inland SAR planning*. Revised. Yorktown, VA: US Coast Guard Training Center.
23. Hill, Kenneth. 1997. *Managing the lost person incident*. 1st ed. Chantilly, VA: National Association for Search and Rescue.
24. Ken Hill, e-mail message to author, April 25, 2008.
25. LaValla, Patrick, Robert Stoffel, B. Wade, J. Brady. (1974). *Search is an emergency*. Tacoma, WA: Emergency Response Institute.
26. Stoffel, Robert. 2006. *The textbook for managing land search operations*. Revised. Cashmere, WA: Emergency Response International.
27. Stoffel, Robert. 2001. *The handbook for managing land search operations*. Cashmere, WA: Emergency Response International.
28. National Association for Search and Rescue. 2002. *Search and rescue operations field guide*. Chantilly, VA: National Association for Search and Rescue.
29. Koester, Robert J. and David Stooksbury. 1992. Lost Alzheimer's subjects: Profiles and statistics. *Response: The Journal of the National Association for Search and Rescue* 11(4):20-26.
30. Young, Christopher S. and John Wehbring. 2007. *Urban search: Managing missing person searches in the urban environment*. Charlottesville, VA: dbS Productions.

## Chapter Seven

1. Coffman, R. 2003. National Park Service Search & Rescue Report. Presented at National SAR Coordinators Briefing, National Association for Search and Rescue Conference. Leesburg, Virginia.
2. Syrotuck, William. 1975. *An introduction to land search: Probabilities and calculations*. Mechanicsburg, PA: Barkleigh Productions, Inc.
3. 95% calculated by the following formula (mean + 2(standard deviation)) = 95.4%.
4. Dougher, Hugh. 2006. *Search management systems; Participant workbook*. 3rd edition. Olympia, WA: ERI International.
5. Cornell, Ed and Donald Heth. 1996. Distance traveled during urban and suburban walks led by 3- to 13-year-olds. *Response: The Journal of the National Association for Search and Rescue* 9(4):22-26.
6. In mid 2007, Barbara Adcock further cleaned the New Zealand Police database, standardized the coordinates, and plotted the IPP and find location. This resulted in an additional 473 elevation reports. Her work continues and should result in over 1,000 additional elevation changes. This will be captured in future editions of this book.
7. International Civil Aviation Organization. 2000. International Standards and Recommended Practices Units of Measurement to be Used in Air and Ground Operations. Annex 5 to the Convention on International Civil Aviation, Fourth Edition. Montreal: ICAO.
8. Heth, Donald and Ed Cornell. 1997. Characteristics of travel by persons lost in Albertan

- wilderness areas. *Journal of Environmental Psychology* 18:223-235.
9. Koester, Robert J. 1998. The lost Alzheimer's and related disorders subject: New research and perspective. *Response 98—National Association for Search and Rescue Conference Proceedings*. Chantilly, VA: National Association for Search and Rescue.
  10. Twardy, Charles, Robert J. Koester, and Rob Gatt. 2006. *Missing person behaviour: An Australian study*. Technical report to the Australian national SAR council. <http://www.sarbayes.org/natsar.pdf>.
  11. Sanders, P. 1987. A New Search Method Based on an Analysis of Air Distress Cases. Atgor Staff Note 2,87: Operational Research Branch. Trenton, Ontario: Air Transport Group Headquarters, Department of National Defence, CFB.
  12. Adams, A., et al. 2007. Search is a time-critical event: When search and rescue missions may become futile. *Wilderness and Environmental Medicine* 18:95-101.
  13. Syrotuck, William. 1976. *Analysis of lost person behavior: An aid to search planning*. Mechanicsburg, PA: Barkleigh Productions, Inc.
  14. Survival Time software.

## Chapter Eight

1. Syrotuck, William. 1974. *Analysis of lost person behavior*. Mechanicsburg, PA: Barkleigh Productions, Inc.
2. Hill, Kenneth. 1999. *Lost person behaviour*. Ottawa: National Search and Rescue Secretariat.
3. Brown, K., et al. 2006. *Investigative case management for missing children homicides: Report II*. Washington, DC: Attorney General of Washington and U.S. Department of Justice Office of Juvenile Justice and Delinquency Prevention.
4. St. John, Michael. 2007. Missing person behavior. In *Urban Search* Christopher S. Young and John Wehbring. Charlottesville VA: dbS Productions.
5. Hanfland, K. A., R. D. Keppel, and J. G. Weis. 1997. *Investigative case management for missing children homicides*. Olympia, WA: Attorney General of Washington.
6. Finklehor, D., G. Hotaling, and A. Sedlak. 1992. The abduction of children by strangers and non-family members: Estimating the incidence using multiple methods. *Journal of Interpersonal Violence* 7(2):226-243.
7. ISRID contains seven cases of children abducted in an urban environment out of 180 lost urban children cases. It also contains three child abductions out of 1,179 wilderness/rural missing child cases.
8. National Center for Missing & Exploited Children. 2007. *Analysis of AMBER alert cases in 2006*. Alexandria, VA: National Center for Missing & Exploited Children. [http://www.amberalert.gov/pdfs/07\\_analysis\\_report.pdf](http://www.amberalert.gov/pdfs/07_analysis_report.pdf).
9. Young, Christopher S. and John Wehbring. 2007. *Urban search: Managing missing person searches in the urban environment*. Charlottesville, VA: dbS Productions.
10. Steidel, S. 2006. *Missing and abducted children: A law-enforcement guide to case investigation and program management*. 3rd ed. Alexandria, VA: National Center for Missing & Exploited Children.
11. While the process of collecting a scent article is not difficult, it is not within the scope of this publication to explain. Almost all dog handlers prefer to collect their own scent article. That is the recommended practice unless trained otherwise.
12. NCMEC has developed software, Simple Leads Management System, designed to manage and prioritize leads associated with missing child investigations. It is available at no cost to appropriate agencies; call 1-888-24-NCMEC (1-888-246-2632).

13. Sanders, P. 1987. A New Search Method Based on an Analysis of Air Distress Cases. Atgor Staff Note 2,87: Operational Research Branch. Trenton, Ontario: Air Transport Group Headquarters, Department of National Defence, CFB.
14. Desmarais, John. 2000. Search planning guidance for use in general aviation missing aircraft searches in the continental United States. Maxwell Air Force Base, AL: Civil Air Patrol National Headquarters.
15. Syrotuck, William and M. McIver. 1975. Preliminary investigation. In *An Introduction to Land Search: Probabilities and Calculations* William Syrotuck. Mechanicsburg, PA: Barleigh Productions, Inc.
16. The distance along track and track offset data have been found to be independent of each other so the two statistics may be combined to provide an overall statistical grid.
17. National Search and Rescue School. 2006. *Inland SAR planning coursebook*. Revised. Yorktown, VA: US Coast Guard Training Center.
18. National Transportation Safety Board. 2001. *Survivability of accidents involving part 121 U.S. air carrier operations, 1983 through 2000*. Safety Report NTSB/SR-01/01. Washington, DC: National Transportation Safety Board.
19. American Psychiatric Association. 2000. *Diagnostic and statistical manual of mental disorders*. 4th ed., revised. Washington, DC: American Psychiatric Association.
20. Lovett, J. 2005. *Solutions for adults with Asperger's syndrome*. Gloucester, MA: Fair Winds Press.
21. Schieve, L., et al. 2006. Mental health in the United States: Parental report of diagnosed autism in children aged 4–17 years; United States, 2003–2004. *Morbidity and Mortality Weekly Review* 55(17):481-486.
22. Sicile-Kira, Chantal. 2004. *Autism spectrum disorders: The complete guide to understanding autism, Asperger's syndrome, pervasive developmental disorder, and other ASDs*. New York: Perigee.
23. Debbaudt, D. 2002. *Autism, advocates, and law enforcement professionals*. London: Jessica Kingsley Publishers.
24. Heth, Donald and Ed Cornell. 1998. Characteristics of travel by persons lost in Albertan wilderness areas. *Journal of Environmental Psychology* 18: 223-235.
25. Hemple, John and Annette Fregeau-Conover (eds.). 2001. *On call: A complete reference for cave rescue*. Huntsville, AL: National Speleological Society.
26. Putnam William, ed. 2007. An overview of the 2004 and 2005 incidents. *NSS News* 65(5) Part 2:2-9.
27. Questions adapted from NCRC Lost Person Questionnaire and Checklist Form NCRC-113. Found in Hemple, John and Annette Fregeau-Conover, eds. 2001. *On call: A complete reference for cave rescue*. Huntsville, AL: National Speleological Society.
28. Anderson, J. and M. Tindal. 1972. The concept of home range: New data for the study of territorial behavior. In *Environmental Design: Research and Practice* W. Mitchell, ed., 1-7. Los Angeles: University of California Press.
29. Hart, R. 1979. *Children's experience of place*. New York: Irvington.
30. Cornell, Ed and Donald C. Heth. 1996. Distance traveled during urban and suburban walks led by 3- to 13-year-olds. *Response: The Journal of the National Association for Search and Rescue* 15(1).
31. Heth's and Cornell's quartile compared to ISRID quartile. The median lost ISRID urban data is 25% greater than Heth's and Cornell's data. The 75% and 95% ISRID data is 60% greater.



32. Plumert, J., et al. 1994. Locating objects and communicating about locations: Organizational differences in children's searching and direction-giving. *Developmental Psychology* 30:443-453.
33. Cornell, E., D. C. Heth, Y. Kneubuhler, and S. Sehgal. 1996. Serial position effects in children's route reversal errors: Implications for police search operations. *Applied Cognitive Psychology* 10:301-326.
34. Doherty, S. 1984. Developmental differences in cue recognition at spatial decision points. PhD diss., Department of Geography, University of California Santa Barbara.
35. Cornell, E., Donald C. Heth., and W. Rowat. 1992. Way finding by children and adults: Response to instructions to use look-back and retrace strategies. *Developmental Psychology* 28:328-336.
36. Hill, Kenneth. 1999. The psychology of lost. In *Lost Person Behaviour*, Kenneth Hill, ed. Ottawa: National Search and Rescue Secretariat.
37. Cornell, Ed and Kenneth Hill. 2004. The problem of lost children. In *Children and their environments: learning, using and designing spaces* C. Spencer and M. Blades, eds. Cambridge, UK: Cambridge University Press.
38. Gibb, Graham and Penny Woolnough. 2007. *Missing persons: Understanding, planning, responding*. Aberdeen, UK: Grampian Police.
39. Berk, Laura. 2004. *Development through the lifespan*. 3rd ed. Boston: Allyn and Bacon.
40. Minino, A., et al. 2002. Deaths: final data for 2000. *National Vital Statistics Reports* 50:15. Atlanta: Centers for Disease Control and Prevention.
41. Williamson, J. and E. Podemski. 2007. *Accidents in North American mountaineering 2007*. Golden, Colorado: The American Alpine Club.
42. Koester, Robert J. 1998. The lost Alzheimer's and related disorders subject: New research and perspective. *Response 98—National Association for Search and Rescue Conference Proceedings*. Chantilly, VA: National Association for Search and Rescue.
43. Trick, G., et al. 1995. Visual field loss in senile dementia of the Alzheimer's type. *Neurology* 45:68-74.
44. Warner, Mark L. and Ellen Warner. 2000. *The complete guide to Alzheimer's proofing your home*. West Lafayette, IN: Purdue University Press.
45. Fortenbaugh, F. C., et al. 2006. *Journal of Vision* 6:565-579.
46. Bruce, Anne and Richard Rosewarne. 1998. *Wandering behaviour in dementia*. Melbourne: Victoria Government Department of Human Services.
47. Koester, Robert J. and David Stooksbury. 1992. Lost Alzheimer's subjects: Profiles and statistics. *Response: The Journal of the National Association for Search and Rescue* 11(4):20-26.
48. Adapted from Koester, Robert J. 1999. *Lost Alzheimer's disease search management*. Charlottesville, VA: dbS Productions. <http://www.wandering.info>.
49. Warner, Mark L. 2006. *In search of the Alzheimer's wanderer*. West Lafayette, IN: Purdue University Press.
50. Matthews, S. and R. Paxton. 2001. Suicide risk. Newcastle, North Tyneside and Northumberland Mental Health NHS Trust. [http://www.cofc.edu/betterthingstodo/Peer\\_Educator/suicide.pdf](http://www.cofc.edu/betterthingstodo/Peer_Educator/suicide.pdf). Accessed September 2007.
51. Malphurs, Julie E. and Donna Cohen. 2005. A statewide case-control study of spousal homicide-suicide in older persons. *American Journal of Geriatric Psychiatry* 13:211-217.
52. Kennedy, D., R. Homant, and R. Hupp. 1998. Suicide by cop. *FBI Law Enforcement Bulletin* August 1998. <http://www.forensiccriminology.com/Suicidebycop.pdf>. Accessed September 2007.

53. Hutson, H. Range, et al. 1998. Suicide by cop. *Annals of Emergency Medicine* 32(6):665-669.
54. Sample Suicide Assessment Form, adapted from Hennepin County Medical Center, Minneapolis, MN. [https://www.ovcttac.org/saact/files/sample\\_suic\\_asmnt\\_form.pdf](https://www.ovcttac.org/saact/files/sample_suic_asmnt_form.pdf). Accessed July 2008.
55. Mitchell, Barry. 1985. A summary of the National Association for Search and Rescue data collection and analysis program for 1980–1985. *Response 85—National Association for Search and Rescue Conference Proceedings*. Chantilly, VA: National Association for Search and Rescue.
56. Hill, Kenneth. 1991. Predicting the behavior of lost persons. *Response 91—National Association for Search and Rescue Conference Proceedings*. Chantilly, VA: National Association for Search and Rescue.
57. Stoffel, Robert. 2006. *The textbook for managing land search operations*. Revised. Cashmere, WA: Emergency Response International.
58. Psychotic disorders include schizophrenia, schizophreniform, schizoaffective, delusional, brief psychotic, shared psychotic, psychotic due to general medical condition, substance-induced psychotic disorder, and psychotic disorder not otherwise specified, as defined in DSM-IV-TR (see reference 19).
59. World Health Organization. *International Statistical Classification of Diseases and Related Health Problems*. 2nd ed., revised. 2004. Geneva: World Health Organization. <http://www.who.int/classifications/icd/en/>.
60. Definition of Mental Retardation. American Association of Intellectual Disability and Development Disorders, Washington DC. [http://www.aamr.org/Policies/faq\\_mental\\_retardation.shtml](http://www.aamr.org/Policies/faq_mental_retardation.shtml). Accessed on December 11, 2007.
61. Baroff, George S. 1999. *Mental retardation: Nature, cause and management*. 3rd ed. Philadelphia: Brunner-Routledge.
62. Montello, D. R. 1998. What it means to be lost. *Proceedings of the Search and Rescue Secretariat of Canada (SARSCENE), Banff, Alberta, Canada*. Ottawa: National Search and Rescue Secretariat.
63. Canyoneering is the activity of traveling in canyons (usually slot canyons which are deeper than they are wide) by several different means. It may involve hiking, jumping, swimming, climbing or rappelling. In other parts of the world the term canyoning is used. In South Africa the term kloofing is used.
64. Rogaining (or rogain) is a longer form of an orienteering event. A time period of often 6-24 hours is given in which to collect as many checkpoints as possible. Each team will have a different strategy for how it will go about collecting checkpoints and, since each checkpoint has a different point value, even which ones it will attempt.
65. American Canyoneering Association. 2002. *Canyons*. Cedar City, UT: American Canyoneering Association. <http://www.canyoneering.net/pdf/canyoneering.pdf>.
66. Fell runner is a term used in the United Kingdom to describe the sport of long distance cross-country mountain running. It often involves steep climbs and has some cross-over with orienteering. Land navigation skills are required.
67. Atkins, Dale. Avalanche accident statistics 1950/50 to 2005/06: By activity, 1996-2005. Boulder, CO: Colorado Avalanche Information Center. <http://www.avalanche.state.co.us/Accidents/Statistics>. Accessed on June 15, 2008.
68. Table derived from Bourque, L. and L. Russell. 1994. Experiences during and responses to the Loma Prieta earthquake. California Governor's Office of Emergency Services. <http://www.sscnet.ucla.edu/issr/da/earthquake/publications/ExperiencesDuring1994.pdf>.

69. Noji, E. K. 2003. Public health consequences of earthquakes. <http://www.pitt.edu/~super1/lecture/lec13021/index.htm>.
70. Durkin, M., et al. 1987. The survival of people in collapsed buildings. Woodland Hills, CA: Michael E. Durkin and Associates.
71. Aguirre, B. E. 1995. The social organization of search and rescue: Evidence from the Guadalajara gas explosion. *International Journal of Mass Emergencies and Disasters* 13(1):67-92.
72. Bowers, Caroline. 2004. It happened to an ICU nurse: An experience on the receiving end of intensive care. *Intensive and Critical Care Nursing* 20(3):174-177.
73. Email communication with Mark Lucas on March 31, 2008.
74. Federal Emergency Management Agency. 1999. *Structural collapse technician manual*. <http://www.fema.gov/emergency/ust/sctc.shtm>.
75. FEMA. USFA/NFA-RS1-SM 1993.
76. Murnane L., J. Fortney, and T. Connell. *Technical rescue for structural collapse*. 1st ed. 2003. Stillwater, OK: International Fire Service Training Association.
77. Armenian, H. K., Noji, E. K. and A. P. Oganessian. 1992. Case control study of injuries due to the earthquake in Soviet Armenia. *Bulletin World Health Organization* 70:251-7.
78. Coburn, A., R. Spence and A. Pomonis. July 1992. Factors determining human casualty levels in earthquakes. Lecture presented at the First International Forum on Earthquake Related Casualties. Madrid, Spain.
79. Table derived from Macintyre, A., J. Barbera, and E. Smith. 2006. Surviving collapsed structure entrapment after earthquakes: A "time-to-rescue" analysis. *Prehospital and Disaster Medicine* 21(1):4-19 <http://pdm.medicine.wisc.edu>.
80. N. Shiraish, M. Shinozuka and Y. Wen (eds.). 1998. *Structural safety and reliability 3*. Rotterdam/Brookfield: AA. Balkens.
81. Roces, M. C., et al. 1992. Risk factors for injuries due to the 1990 earthquake in Luzon, Philippines. *Bulletin World Health Organization* 70:509-14.
82. Brewster, B. Chris. 2003. *Open water lifesaving: The United States lifesaving association manual*. Boston: Pearson Custom Publishing.
83. Teather, R. 1994. *Encyclopedia of underwater investigations*. Flagstaff, AZ: Best Publishing.
84. Pounder, D. 1992. Bodies from water. Lecture notes, Department of Forensic Medicine, University of Dundee. <http://www.dundee.ac.uk/forensicmedicine/notes/water.pdf>.
85. Haupt, Gary. 2006. Drowning investigations. *FBI Law Enforcement Bulletin* 75(2):14-22.
86. Attributed to Simpson in Pounder, D. 1992. Bodies from water. Lecture notes, Department of Forensic Medicine, University of Dundee. <http://www.dundee.ac.uk/forensicmedicine/notes/water.pdf>.
87. Data from Castle Lake Limnological Research Station. [http://castlelake.ucdavis.edu/castle\\_lake/ecosystem](http://castlelake.ucdavis.edu/castle_lake/ecosystem).
88. Hardy, M. 1992. Water search with dogs. *Response 92—National Association for Search and Rescue Conference Proceedings*. Chantilly, VA: National Association for Search and Rescue.
89. 50% within 10 feet and 95-99% within radius percent figures. The bulk of the data came from subjects breaking through the ice where it is possible to get an accurate IPP, and from instructional workshops where objects are routinely tossed into the water. Personal communication with Walt "Butch" Hendrick, September 2007.
90. Hendrick, W. and A. Zaferes. 2000. *Public safety diving*. Tulsa, OK: PennWell Corporation.
91. Ray, Slim. 1997. *Swiftwater rescue*. Asheville, NC: CFS Press.
92. The Hardy paper did not give median values, only average values, count, and maximum value. The "median" value was obtained by subtracting out the maximum value and calcu-

lating a new average value with the lower count. It is highly likely that the given value is still greater than the true median.

93. The Hardy paper did not list the standard deviation, therefore it is not possible to calculate the 95%. However, the paper did list the maximum value; this is the number presented. For the 16 cases reported in the paper, the average was 50 yards and the maximum value was 500 yards. This means the total distance was 50 yards x 16 = 800 yards. Subtracting the maximum case gives a total of 300 yards to allocate among 15 cases. Therefore, the 95% must be less than 300 yards and may be considerably less.
94. The Hardy paper did not list the standard deviation, therefore it is not possible to calculate the 95%. However, the paper did report a maximum value; it is presented for rivers and streams. It is reasonable to expect the 95% may be considerably less than the maximum.
95. US Coast Guard. 2007. U.S. Coast Guard Addendum to the United States National Search and Rescue Supplement (NSS) to the International Aeronautical and Maritime Search and Rescue Manual (IAMSAR). Washington, DC: US Department of Homeland Security, United States Coast Guard. COMDTINST M16130.2D.
96. Donohue, W. A. 1993. *Operation S.T.A.R.: Submerged transportation accident research; Final report, Michigan Department of State Police*. East Lansing, MI: Department of Communication, Michigan State University.

## Chapter 9

1. O'Connor, Daniel, ed. 2007. *Managing the lost person incident*. 2nd ed. Chantilly, VA: National Association for Search and Rescue.
2. Stoffel, Robert. 2006. *The textbook for managing land search operations*. Revised. Cashmere, WA: Emergency Response International.
3. Dougher, Hugh. 2006. *Search management systems: A practical approach to initiating and directing efforts to resolve missing persons reports*. 3rd ed. Olympia, WA: ERI International, Inc.
4. The maritime and aeronautical search communities use the term probability of containment (POC). It is synonymous with POA. In fact, during the drafting of the IAMSAR Manual, both terms were proposed. Jack Frost, e-mail message, February 24, 2008.
5. Frost, Jack. 1998. *The theory of search*. Washington, DC: Soza & Company and U.S. Coast Guard, Office of Search and Rescue. [http://www.sarinz.com/index.cfm/3,112,261/principles\\_of\\_search\\_theory.pdf](http://www.sarinz.com/index.cfm/3,112,261/principles_of_search_theory.pdf). Accessed June 29, 2008.
6. CASIE, Lovelock, Ebersole, Bownds. Software may be downloaded for free from <http://math.arizona.edu/~dsl/casie/casie.htm>. Accessed May 2008.
7. Win CASIE III, Bownds, Ebersole, Lovelock, O'Connor, Toman. Software may be downloaded for free from <http://www.wcasie.com>. Accessed April 2008.
8. Heth, Donald and Ed Cornell. 1997. Characteristics of travel by persons lost in Albertan wilderness areas. *Journal of Environmental Psychology* 18:223-235.
9. SAR Technology, Incident Commander Pro
10. Probability Mapper software. <http://www.SARBayes.org>.
11. The author has a commercial interest in products including software developed by Fronterra, a spin off company to the original work conducted by Hummingbird Consulting.
12. Mattson, Robert J. 1976. Establishing search areas. *Search and Rescue Magazine* Spring 1976:7-8.
13. Surowiecki, James. 2004. *The wisdom of crowds: Why the many are smarter than the few and how collective wisdom shapes business, economies, societies and nations*. New York: Little Brown.

14. National Search and Rescue School. 2006. *Inland SAR planning coursebook*. Revised. Yorktown, VA: USCG Training Center.
15. Hill, Kenneth. 1992. Analyzing lost person scenarios. *Response* 11(1): 23-27.
16. Cooper, Donald C. 1999. Search Management and Planning Course Handouts. Mountain Rescue Council of England and Wales, Bangor, North Wales.
17. Syrotuck, William. 1976. *Analysis of lost person behavior: An aid to search planning*. Mechanicsburg, PA: Barkleigh Productions, Inc.
18. PSR can be thought of as  $PSR = POS / \text{searcher hours}$ . However, the more formal formula is  $PSR = W$  (sweep width) x speed x probability density (POA/area of region). Defined in Cooper, D.C., J. R. Frost, and R. Q. Robe. (2003). Compatibility of Land SAR Procedures with Search Theory. Prepared for the National Search and Rescue Committee. Alexandria, VA: Potomac Management Group. <http://www.uscg.mil/hq/g-o/g-opr/nsarc/LandSearch-MethodsReview.pdf>. Accessed on March 25, 2008.
19.  $POA_{newX} = ((1 - PODX) * POA_{oldX}) / (1 - (PODX * POA_{oldX}))$  [*What are you doing looking at this stuff?!* –R.J. Koester] This is one of several formulas used to shift POA in the past. For a complete review see Cooper, D.C. (2000). The application of search theory to land search: The adjustment of probability of area. Cuyahoga Falls, OH: Privately published.

## Appendix A

The missing person form has a long history. The form shown here was updated, modified, and adopted for this particular publication. This form was modified from the Missing Person Report Form developed by Ralph Wilfong and Robert “Skip” Stoffel. That particular form was adopted from a form developed by the Virginia Search and Rescue Council, which was adopted from the first known questionnaire developed by the National Park Service. The form itself is not copyrighted.

## Appendix B

1. Wireless Communications and Public Safety Act of 1999, Pub. L. No. 106-81, enacted Oct. 26, 1999, 113 Stat.1286.
2. See Revision of the Commission’s Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems, CC Docket No. 94-102, Fourth Memorandum Opinion and Order, 15 FCC Rcd 17442 (2000) (E911 Fourth Memorandum Opinion and Order). See also e.g., In the matter of Revision of the Commission’s Rules To Ensure Compatibility with Enhanced 911 Emergency Calling Systems Request for Waiver by AT&T Wireless Services, Inc., Order, 16 FCC Rcd. 18253.
3. Gurs, Robert and Yucel Ors. 2007. Commission rules on PSAP-level accuracy. *Public Safety Communications* 75(11):16-17.
4. 9-1-1 Fast Facts, Wireless 9-1-1 Progress based upon the most recent FCC quarterly filings. <http://nena.org/pages/Content.asp?CID+144&CTID=22>. Accessed on May 10, 2008.
5. <http://nena.ddti.net/>. Accessed on February 11, 2008.
6. Area calculated based upon  $\pi r^2 = A$ .  $(3.14) * (0.3)(0.3) = 0.28$  sq kilometers.