TACTICAL CRIME ANALYSIS

Research and Investigation

```
.0010001010100
                                       .837 6061910100111010005060010100001012
00180. 9161001110100001610018000016166000
                                                                           00001010100001010.
                                                                                        19100115
                                                  J100000000000
                                                                                             110001
                                                   1100101001000
                   J1010010001010
                                                    10101001110
101000100
                                                                                              0001
              J1006-00101001000100 .
00101001000101010111010.
                                                                                            .00010
                                                                                          J001010C
                                                        010010.
                     01110100000000010100
         JU0101
                                                                                      .0010100
                     0010000001010010001
                                                          101010011.
                                                             01001010010001010100111010
                            100000100001
  J1000
                                                                  010011101000000000
                                  10101001
,1010
                                      10001
0100
                                     .00010
                                  J10100
60100
                             JU1010000
 101001110100
   100000101011000000101001000
     1491001000000101001000
```

Derek J. Paulsen | Sean Bair | Dan Helms



TACTICAL CRIME ANALYSIS

Research and Investigation

Derek J. Paulsen | Sean Bair | Dan Helms





CRC Press is an imprint of the Taylor & Francis Group, an **informa** business

CRC Press Taylor & Francis Group 6000 Broken Sound Parkway NW, Suite 300 Boca Raton, FL 33487-2742

© 2010 by Taylor and Francis Group, LLC CRC Press is an imprint of Taylor & Francis Group, an Informa business

No claim to original U.S. Government works

Printed in the United States of America on acid-free paper 10 9 8 7 6 5 4 3 2 1

International Standard Book Number: 978-1-4200-8697-3 (Hardback)

This book contains information obtained from authentic and highly regarded sources. Reasonable efforts have been made to publish reliable data and information, but the author and publisher cannot assume responsibility for the validity of all materials or the consequences of their use. The authors and publishers have attempted to trace the copyright holders of all material reproduced in this publication and apologize to copyright holders if permission to publish in this form has not been obtained. If any copyright material has not been acknowledged please write and let us know so we may rectify in any future reprint.

Except as permitted under U.S. Copyright Law, no part of this book may be reprinted, reproduced, transmitted, or utilized in any form by any electronic, mechanical, or other means, now known or hereafter invented, including photocopying, microfilming, and recording, or in any information storage or retrieval system, without written permission from the publishers.

For permission to photocopy or use material electronically from this work, please access www.copy-right.com (http://www.copyright.com/) or contact the Copyright Clearance Center, Inc. (CCC), 222 Rosewood Drive, Danvers, MA 01923, 978-750-8400. CCC is a not-for-profit organization that provides licenses and registration for a variety of users. For organizations that have been granted a photocopy license by the CCC, a separate system of payment has been arranged.

Trademark Notice: Product or corporate names may be trademarks or registered trademarks, and are used only for identification and explanation without intent to infringe.

Visit the Taylor & Francis Web site at http://www.taylorandfrancis.com

and the CRC Press Web site at http://www.crcpress.com

Authors

Derek J. Paulsen is currently an associate professor in the Department of Criminal Justice and Police Studies at Eastern Kentucky University at Richmond. Dr. Paulsen has published numerous articles dealing with crime mapping and crime analysis issues that have appeared in such journals as Policing: An International Journal of Police Strategies and Management, Journal of Investigative Psychology and Offender Profiling, International Journal of Police Science and Management, and Journal of Criminal Justice and Popular Culture. A frequent presenter on crime mapping topics at both academic and professional conferences, Dr. Paulsen has been an invited speaker numerous times at the National Institute of Justice (NIJ) MAPS Conference, NIJ Conference, UK Crime Mapping Conference, and the International Investigative Psychology Conference. In addition to crime mapping and tactical analysis, Dr. Paulsen's research focuses on crime and urban planning, socially sustainable design, and geosimulation of crime.

Dan Helms is a private consultant working for various defense and law enforcement agencies. He is the former program manager of the Crime Mapping and Analysis Program (CMAP), a program of the National Law Enforcement and Corrections Technology Center, NIJ. Prior to his work at CMAP, Mr. Helms served as crime analyst for the Las Vegas Metropolitan Police Department, where he specialized in spatial analysis and prediction of serial crime. He is the chair of the Professional Applications and Measures Committee for the International Association of Investigative Psychologists. He currently develops professional software and advanced analytical methodologies for justice, defense, and intelligence organizations. Mr. Helms works closely with Bair Software, Inc., a leading consulting and software production firm in the crime and intelligence analysis community. He currently splits his time between Denver, Colorado and Washington D.C. Mr. Helms has made numerous appearances on television and radio, and has been featured in a television documentary. He has spoken at MAPS, IACA, CCIAA, NIJ, and ACJS conferences in the USA, and the International Investigative Psychology Conference in the UK.

Sean Bair is the president of Bair Software, Inc., a Colorado-based software company dedicated to providing consulting, training, and cutting-edge solutions to the law enforcement, intelligence, and defense communities. He is the

xiv Authors

former assistant director at the National Law Enforcement and Corrections Technology Center, as well as a former crime analyst and police officer for the Tempe (AZ) Police Department. He holds an MBA degree from the University of Denver. Mr. Bair has made numerous appearances on television and radio, providing commentary or instruction on the analysis of crime and other law enforcement related matters. He has trained thousands of analysts, officers and investigators around the world in the analysis of crime. The associated website www.bairsoftware.com contains supplemental material that provides a richer learning experience.

Table of Contents

Authors		xiii
	SECTION I	
1	Introduction of Crime Analysis	3
	Introduction Conclusion	3 7
2	Understanding Criminal Behavior	9
	Introduction	9
	Rational Choice	9
	Research Findings	11
	Routine Activities Theory	13
	Research Findings	15
	Crime Pattern Theory	16
	Research Findings	18
	Opportunity Makes the Thief	19
	Conclusion	23
3	Behavioral Geography	25
	Introduction to Behavioral Geography	25
	Spatial Behavior	27
	Mental Maps and Awareness Space	27
	Research on Mental Maps and Awareness Space	29
	Journey-to-Crime	32
	Journey-to-Crime Research	33
	Thinking Criminal	35
4	Exploring Crime Types	45
	Introduction	45
	Homicide	45
	Robbery	47
	Burglary	49
	Auto Theft	51

	Sexual Assault	54
	Conclusion	55
5	Linking Crime	57
	Introduction	57
	Linkage Blindness	58
	Jane Smith	58
	Sheriff Joe	59
	Who, What, Where, When, How and Why	60
	The Dresser Drawers Theory	60
	The Investigative Mindset: Fact and Inference	62
	Process Models: The IZE Method	64
	Process Models: Inductive Versus Deductive	68
	Process Models: Quantitative Identification	70
	Data Mining	71
	Data Mining: Regular Expressions	72 74
	Data Mining: Concepts	74
	Conclusion	75
6	Temporal Analysis	77
	Introduction	77
	Definitions	77
	Basic Assumptions	78
	Primary Time of Occurrence	79
	Multiple Times of Occurrence	79
	Aoristic Analysis	80
	Temporal Analysis Units	81
	T Coordinates	82
	Temporal Study Area (Range)	82
	Temporal Distribution	83
	Tempo	86
	Velocity	87
	Temporal Cycles	87
	Time Series Analysis	88
7	Geographic Profiling	91
	Introduction	91
	Background of Geographic Profiling	91
	Geographic Profiling Schools of Thought	92
	Criminal Geographic Targeting (CGT)	93
	Personalities and History	93

Table	of Contents	vii
	Application	93
	Investigative Psychology (Ι-Ψ)	95
	Personalities and History	95
	Application	96
	CrimeStat	97
	Personalities and History	97
	Application	97
	Empirically Calibrated Decay Functions	100
	Wedge Theory	100
	Personalities and History	101
	Application	101
	Geoforensic Analysis	101
	Personalities and History	101
	Application	102
	Philosophical Foundations	102
	Individual Methods	103
	Research on the Accuracy of Geographic Profiling Systems	105
	Glossary of Terms	107
8	Forecasting and Prediction	109
	Overview	109
	Why Forecasts Work	110
	Why Forecasts Don't Work	110
	The Utility of Forecasts	111
	Temporal Forecasting	111
	Spatial Forecasting	112
	Why Predictions Work	112
	Decision Models	113
	Why Predictions Don't Work	117
	Methods	120
	Percent Change	121
	Correlation	123
	Autocorrelation	123
	Linear Trend Estimation (Regression)	125
9	Intervention	127
	Introduction	127
	Objectives	128
	Intervention Strategies	132
	Opportunity Cost	135
	Tactics	135
	The Action Plan—A Combined Approach	136

SECTION II

10	Getting Started	141
	Goals of This Section:	141
	Introduction	141
	Accessing the Textbook Web page	141
	Online Resources	141
	Obtaining the Software	142
	Open and Evaluate Data using ATAC	142
	Lesson 1: Open the Sample Database in ATAC	142
	Practice on Your Own: Evaluate Crime Data Using ATAC	142
	ATAC and Microsoft Access	143
	Lesson 2: Open a Microsoft Access Database in ATAC	143
	Practice on Your Own: Evaluate Call for Service Data	144
	ATAC and Microsoft Excel	144
	Lesson 3: Open a Microsoft Excel Spreadsheet in ATAC	145
	Lesson 4: Open the Sample Database in Excel	145
	Practice on Your Own: Evaluate Data Using Microsoft	
	Excel	145
	Lesson 5: Import Data from Access into Excel	145
	Practice On Your Own: Import Data into Excel	147
	Review Exercise: Open Other Data	147
	Review Questions	147
11	Identify Patterns Using the IZE Method (Process	
	Models)	149
	Goals of This Section:	149
	Introduction	149
	Layouts in ATAC	150
	Lesson 6: Organizing a Layout Using ATAC	150
	Lesson 7: Saving a Layout in ATAC	151
	Layouts in Excel	152
	Lesson 8: Organizing a Layout Using Excel	152
	Practice On Your Own: Create a Robbery Layout Using	
	Microsoft Excel	152
	Sorting Data	153
	Lesson 9: Organizing Data by Sorting in ATAC	153
	Lesson 10: Organizing Data by Sorting in Excel	154
	Review Exercise: Create Sorts for Three Crime Types	154
	Review Questions	154

Table of Contents ix

12	Minimize and Maximize—IZE method	155
	Goals of This Section:	155
	Introduction	155
	Structured Query Language	155
	Lesson 11: Minimize Using the Visual Query Module in	
	ATAC	156
	Lesson 12: Minimize Using the Filter Bar in ATAC	157
	Lesson 13: Minimize Using the Filter Bar in Excel	158
	Practice on Your Own: Minimize Data Using Excel	159
	Practice on Your Own: Find the Twins	159
	Practice on Your Own: Identify a Crime Series	160
	Regular Expressions	160
	Lesson 14: Create and Run a Regular Expression	160
	Lesson 15: Create and Run a Proximity Search Regular	
	Expression	161
	Lesson 16: Create a Concept	162
	Lesson 17: Create and Run a Proximity Search Concept Review Exercise: Using RegEx to Perform the Inductive	163
	Method	164
	Review Questions	165
13	The Behavioral Dimension: Describing the	
	Problem	167
	Goals of This Section:	167
	Introduction	167
	Archetypes	168
	Lesson 18: Creating an Archetype from ATAC	168
	Movement Logs	168
	Lesson 19: Develop a Movement Log	169
	Review Exercise: Creating an Archetype	170
	Review Questions	170
14	The Temporal Dimension	171
	Goals of This Section:	171
	Introduction	171
	Activity Schedules	172
	Lesson 20: Creating an Activity Schedule	172
	Lesson 21: Create a Temporal Topology Using Excel	173
	Lesson 22: Create a Temporal Topology Using ATAC Practice On Your Own: Evaluate Time of Day and Day of	174
	Week for Various Crimes	175

	Dynamic Temporal Analysis	177
	Temporal Distribution	177
	Tempo	178
	Lesson 23: Create a Tempogram in ATAC	178
	Lesson 24: Create a Tempogram in Excel	179
	Lesson 25: Create a Mean Interval Forecast with Excel	180
	Practice on Your Own: Calculate Mean Interval for	
	Various Other Crimes	181
	Variograms	181
	Lesson 26: Create a Variogram Using Excel	181
	Lesson 27: Create a Variogram Using ATAC	182
	Practice on Your Own: Calculate Lag Variograms	100
	against Various Other Crimes	183
	Lesson 28: Study of Correlation Using Excel	184
	Lesson 29: Study of Correlation Using ATAC	186
	Review Exercise: Evaluate Other Crime Series Using	
	Correlation	187
	Review Questions	188
15	The Spatial Dimension	189
	Goals of This Section:	189
	Introduction	189
	Preparing for Spatial Analysis	190
	Lesson 30: Launching ArcGIS and Exploring the Interface	190
	Lesson 31: Add the Gotham City Crime Series Using ArcGIS	191
	ArcGIS and the Spatial Analyst Extension	191
	Lesson 32: Loading Spatial Analyst	192
	ArcGIS and SPACE (Spatial Predictive Analysis of Crime	
	Extension)	192
	Lesson 33: Loading the SPACE Tools in ArcGIS	193
	Preparing for Spatial Analysis Using Google Earth	193
	Lesson 34: Load Points in Google Earth	193
	Lesson 35: Export to Google Earth	194
	Preparing for Spatial Analysis Using ATAC	194
	Lesson 36: Loading Points in ATAC	195
	Point Distributions	196
	Frame of Reference	196
	Lesson 37: Frame of Reference	196
	Identify Point Distribution	196
	Mean Nearest Neighbor	198
	Lesson 38: Calculating Nearest Neighbor Statistics	198
	Density Fields	198

Table of Contents xi

Lesson 39: Density Fields Using ArcGIS	199
Lesson 40: Calculating Density Analysis in ATAC	200
Minimum Convex Polygon	201
Lesson 41: Minimum Convex Polygon	202
Standard Deviation Ellipse	202
Lesson 42: Standard Deviation Ellipse	202
Spider Analysis	202
Lesson 43: Spider Analysis	203
Lesson 44: Establishing Offender Activity Space Using	
Spider Lines and Density Fields	205
Space-Time Analysis	206
Sequence Lines	206
Lesson 45: Sequence Lines	208
Geographic Profiling	208
Lesson 46: Calculate the Great Circle against the Beltway	
Sniper Series	208
Practice On Your Own: Are you a Marauder or	
Commuter?	209
Lesson 47: Create a Newton-Swoope Geoforensic Profile of	
the Beltway Sniper Series	210
Review Exercise: Using the Great Circle and Geographic	
Profiling	211
Review Questions	212
Bibliography	213
Index	219

Section I



Introduction of Crime Analysis

Introduction

Crime analysis is an emerging discipline within the field of public safety. In its current state of near infancy, the functions, techniques, products, and even the nomenclature critical to this new profession are still being defined. When one becomes a police officer, one enters a standardized and accredited training program. Every department knows the specifics of each officer training each officer and knows that each officer demonstrated competency in core skills upon completion of the program. When an agency looks to hire an officer, it knows that the officer has the skills necessary to protect and serve the public. This is not the case for a crime analyst. The skills of crime analysts in the United States vary drastically from place to place, even within a single law enforcement agency. In one department, an analyst may only have the skills and functions necessary for data entry and yet hold the title of crime analyst. In another, the analyst may provide valid and useful spatial, statistical, and temporal analysis to the department, which in turn uses the analyst's results to make more informed and effective decisions. As in any emerging profession, efforts are being made to standardize the skills and training of crime analysts. Within the next decade or so, the skills and training of crime analysts and crime analysis units will be as commonplace and standardized as those of police officers.

Crime analysis is a collection of police functions that provide analytical and decision support to law enforcement and public safety agencies. Although the analysis of crime is implicit in the title, crime analysts also study police activity and may range farther afield in support of their mission. The crime analyst is a support unit, not a primary police unit. This is no trivial role, however. The crime analyst is no less vital to the sworn police officer than his patrol car or radio. When properly utilized, the analyst can provide direction and guidance that act as a force multiplier. A typical crime analyst can be expected to improve the efficiency of the investigators and patrol force; thereby effectively increasing the agency's ability to serve the community to a greater degree than a single new officer or detective.

The crime analyst's role is to support decision making by police officers and administrators through effective analysis and presentation of information. Although the analyst is seldom a decision maker, no part of police operations should be aloof from scrutiny by the crime analyst. The ability to effectively retrieve, analyze, and disseminate information means that the analyst acts as a decision supporter. It is the place of the analyst to recommend and advocate effective actions and strategy based on her or his professional expertise. While the analyst should not be giving orders to sworn personnel, decisions made without benefit of analytical support are unlikely to be the best decisions.

Crime analysts must not only be proficient at statistical techniques and mathematics, but specialists in technology as well. The typical crime analyst must have a comprehensive understanding of data and databases, the software used to retrieve those data and analyze them, but also the personality and credibility to present his or her finding to a group who does not understand either. An analyst must use technology and delve into disciplines that others make their careers from in order to provide the department with information that is timely, accurate, and operationally useful.

Most crime analysts now recognize four main divisions of the profession: tactical, strategic, operational, and administrative. Although many departments are beginning to see the importance of specialization, most analysts still must manage their day to provide service across all four areas. In doing so, analysts may be relegated to the role of jack-of-all-trades, but masters of none. In this introductory chapter, we will briefly explore various definitions that have been advanced for the four types of crime analysis. We will begin with the authors' own simple, albeit broad, definitions of these categories:

- Administrative analysis is the study of police efficiency and effectiveness.
- Strategic analysis is the study of crime trends and statistics.
- Tactical analysis is the identification, analysis, and resolution of crime incidents, patterns, series, and sprees.
- Operational analysis is the study and support of specific police activities.

Tactical crime analysis is the comprehensive identification, evaluation, analysis, and resolution of specific criminal activity problems. These problems are typically categorized as being incidents, patterns, series, or sprees. Tactical problems are characterized as being distinct from mainstream criminal activity due to the presence of recognizable identifiers which distinguish them as belonging to an identifiable category. Incidents are unique crime events unrelated to other events, but distinguishable from mainstream criminal activity because of their significantly unique properties. Incidents demand directed attention (i.e., a schoolroom spree-killing). Patterns are criminal activities that are related by a number of characteristics such as location, modus operandi (MO), time, or day. However, critical incidents do

not have sufficient suspect information to either confirm or refute the causality behind the related incidents. Series are sets of criminal activity that are believed to share the same causality. By causality, we mean that the same offender, group of offenders, criminal organization, gang, or enterprise is responsible for planning or perpetrating the involved crimes. The aim of the tactical crime analyst is to resolve each individual problem as quickly and decisively as possible for the immediate benefit of the public safety.

Strategic crime analysis is the comprehensive identification, evaluation, analysis, and resolution of non-specific criminal activity problems. These problems are descriptive of mainstream criminal activity; the strategic crime analyst, therefore, deals with those problems making up the vast majority of threats to the public safety. The aim of the strategic crime analyst is to increase public safety by reducing the level of crime throughout his or her jurisdiction.

Operational crime analysis is the comprehensive identification, evaluation, analysis, and resolution of specific police activity problems. These problems are characterized as being distinct from mainstream police activity because of the unusual and atypical nature of each problem. Police activity problems involve activities initiated and performed by police, law enforcement, and public safety authorities (e.g., patrol operations, traffic stops, surveillances, warrant services, etc.), as opposed to criminal activity, which are crimes perpetrated by offenders. The goal of the operational crime analyst is to resolve each individual problem as quickly and decisively as possible for the improvement of the public safety through the successful police operation.

Administrative crime analysis is the comprehensive identification, evaluation, analysis, and resolution of both non-specific police activity problems. These problems are characterized as being descriptive of mainstream police activity problems; the administrative crime analyst therefore deals with those problems making up the vast majority of problems relating to police activity. The aim of the administrative crime analyst is to increase public safety by increasing the efficiency of police activity.

In recent years, tactical and operational analysis have somewhat gained in ascendancy over the previously dominant strategic and administrative analytical paradigms. The prevalent acceptance of concepts such as problem oriented policing (POP), community oriented policing (COP), crime prevention through environmental design (CPTED), the recurrence of high-profile criminal incidents such as spree-killings and terrorist attacks, and the public and police fascination with serial offenders have all conspired to increase the focus on tactical and operational problems. This has resulted in a corresponding de-emphasis on strategic and administrative functions as resources are prioritized.

In the United States, tactical crime analysis has become a type of analysis where analysts are beginning to specialize. Many departments are hiring a tactical crime analyst because the functions require so much of an analyst's