implementation. Furthermore, this chapter on flight planning goes beyond the topic of guidance for single aircraft, found in many other books, by including a short discussion on resource management for a team of autonomous UAVs which is highly relevant given current developments in coordinated UAV operations.

Flight safety is the final topic covered in the book. Some limited background is provided for flight operations, but the reader will find that flight safety is really treated from a systems and control perspective that focuses on the role of fault tolerance, situational awareness and vehicle health management. Various filtering methods are introduced in the context of situational awareness alongside simultaneous localisation and mapping techniques. Fault-tolerant control as well as fault-tolerant planning are discussed.

To conclude, the subject area covered in this book is very broad. Naturally, therefore, topics such as nonlinear flight control or health monitoring are not covered from all perspectives. Yet it is an exceptional effort that brings together key aspects of UAV flight control and planning in a single book and it is a good starting point for engineers and academics alike.

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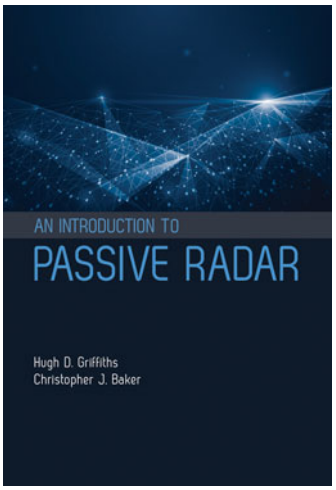

An Introduction to Passive Radar

H. D. Griffiths and C. J. Baker

Artech House, 16 Sussex Street, London, SW1V 4RW, UK. 2017. 212pp. £111. ISBN 978-1-63081-036-8.

An Introduction to Passive Radar is an interesting and relevant book covering a range of important topics within the area of passive radar. Passive radar is itself an interesting title and there might be uncertainties as to what it means and includes. Readers might be forgiven for being slightly quizzical since radar is, almost always, reliant on some form of active signal reflection. Passive radar, as a term, is broadly synonymous with bistatic/multistatic radar and this terminology may be more familiar to some readers.

The authors recognise this is not a detailed mathematical treatise. It is, essentially, a

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broad coverage of many of the pertinent principles and areas of passive radar (according to their definition) and aims to provide an up-to-date introduction and overview.

Chapter 1 usefully introduces terminology and some history, although I wonder it if the authors' so-called 'second resurgence' of interest in the topic, from the 1970s and 1980s, is covered a little superficially? Chapter 2 introduces several properties of passive radar, particularly, geometrical, parameter measurement and estimation and clutter aspects. This is both important and helpful since it gives the reader an insight into some of the complexities and limitations inherent in a bistatic/multistatic configuration necessary in passive radar. Chapter 3 is to be commended as it includes, in outline, the concept of the radar ambiguity function as appropriate to bistatic radar. Using a variety of candidate illuminator waveforms, the ambiguity functions of these are summarily described and discussed. The authors might have left some of the technology and system engineering aspects for a future book, as critical technology requirements and solutions, such as antenna architectures, signal and data processing, synchronisation and communications, are not fully covered.

Chapter 5 progresses the treatment to performance prediction, utilising the bistatic radar equation as a starting point. Interestingly, graphical detection range estimates using broadcast FM VHF, DAB radio and 1.8Ghz cell phone transmissions are presented. This is extended and complemented in Chapter 7, presenting some examples of practical systems and experimental results, including airborne passive radar, satellite-borne illuminators and synthetic aperture radar. The book concludes in Chapter 8 with an insight into speculative applications and possible future directions of the work. Perhaps the most interesting applications and developments might be: passive radar applied to air traffic management; the intelligent, adaptive (multi-node) radar network and low-cost radar.

I am slightly disappointed by of some of the references given throughout the book which do not seem fully to recognise the important and formative research work undertaken by other key workers in the field, particularly during the 1970s and 1980s. From a UK perspective, it might be suggested that Dr Ken Milne be called the father of the rebirth of interest in bistatic/multistatic radar in the 1970s – his foundation paper of 1977 is not quoted in the book. The published bistatic/multistatic radar research of workers including Fleming, Dicken, Knowles, Crossfield, Retzer, Hanle, et al. do not seem to be mentioned. It is pleasing, however, that reference is made to Mike Jackson's 1986 significant paper on 'The Geometry of Bistatic Radar Systems' (*IEE Proceedings F – Communications, Radar and Signal Professing,* Vol 133 (7) December 1986).

I think that I should just point out, diplomatically I hope, Professor Kulpa's statement in his Foreword that research work on passive radar was initiated by Professor Griffiths at University College London in 1982 is, I believe, not quite accurate. As I recall, the work at UCL was initiated by Professor D. E. N. Davies, Dr J. R. Forrest and Mr. J. G. Schoenberger and was extant certainly in 1979, as confirmed, for example, in the proceedings of the *1981 IEE Colloquium Ground and Airborne Multistatic Radar*.

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In a conclusion that is an eminently readable and useful overview treatment of the topic of passive radar and the authors are to be commended in writing and publishing the book. It should encourage an increased interest in the research and applications. Also, I hope that it will encourage the preparation of a further book or books, covering several of the areas within passive radar in greater depth.

Dr Chris Pell, FRAeS

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