



MODELLING RADAR-ECCM A SYSTEM APPROACH

AK Subramanian



Defence Scientific Information & Documentation Centre
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AK Subramanian

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PREFACE

Conflict situations are part of human life. What this monograph wishes to deal with is about the area of conflict that World Wars have brought about; that of the electronic encounters, often fraught with far-reaching consequences. History has many tales to tell, from the advent of World Wars, Egypt-Israeli conflicts, Lebanon-Syria-Falkland encounters to the repeated encounters in Iraq of the present times.

That the electronic battlefield's armour is 'Technology' is well understood. However, its application, results and evaluation are mired in controversy, deception and secrecy—to become ultimately justifiable and be synonymous with country's honour at the theatre of war.

It is the intention of this monograph to attempt an analysis on one aspect of the electronic warfare—the counter countermeasure of a radar sensor during an electronic conflict. Finally, to the broad question of peace time simulation initiatives so that we are all prepared to prevent the inevitable reaction under duress.

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AK Subramanian

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CHAPTER 1

INTRODUCTION

1.1 IMPORTANCE OF ECM

The importance of Electronic Countermeasure (ECM) and Electronic Counter Countermeasure (ECCM) in strategic and tactical electronic warfare is not overstated. The ultimate survival of any electronic system today is measured in terms of its operational efficiency and survivability under adverse electromagnetic environment. Defence radar and communication networks are made vulnerable under such heavy and concentrated attack. Apart from the conventional ECM attack delivered through aerial and ground resources, a nuclear strike has its own formidable component of Electromagnetic Pulse (EMP) which can paralyse the entire chain of electronic sensors and associated communication channels. A new dimension in the present era is the added threat of the cyber warfare.

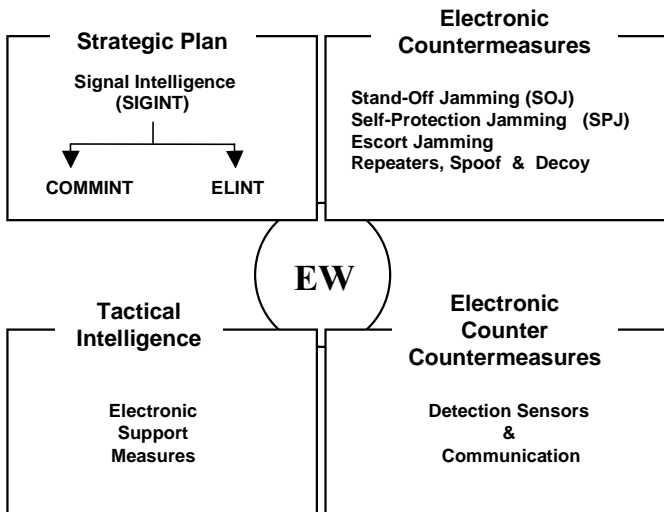


Figure 1.1. Electronic warfare

1.2 BACKGROUND

Considering its effective usage since World War II, it is not surprising that the art of Electronic Warfare has gone through a sea change over the last century. The real assessment of one's might as well as weakness in this area, is unfortunately proved only during a major conflict. Modern examples have all been well documented: those of the conflicts in Lebanon, Golan Heights, Falklands, and the latest in the Gulf region. Whichever be the theatre of war in future, it is amply clear that the initial strike would be on the vital electronic defences of a country, be it the missile complex, communication network, major air-defence installation or the central and field headquarters.

The concept of a country's boundary, guarded by its natural geographical features, stays only as an historical fact these days. Thanks to the modern technology, weapon development and delivery systems, no nation needs to invade another territory to start a war. Physical occupation may come later, but the initial threat and thrust can be delivered from a safe distance. It is presumed that the United States of America covertly supported bombing of Iraqi Nuclear Facility by Israeli fighter planes. American Warships positioned in the Mediterranean, guided the Israeli fighters as well as provided facilities for the mid-air refuelling of its aircraft. The Falkland War and the Gulf War had strong support of satellite surveillance.

Further, even when delineated, the boundaries of a country have a way of expanding due to economic and political reasons. The USSR, when it existed, had its own ring of satellite countries and the Warsaw Pact to protect its air space and the seas. America's reach was even wider and farther from its own country. In India, due to the exploration of natural resources from the sea, the naval complement of our defence effort extends our concern on air-defence, even farther from the existing land boundaries. All in all, the subject of air-defence rules the world as a modern dynamic entity, precariously balanced and vulnerable to changes.

1.3 BASIC CONSIDERATIONS

Radar and communication systems have gone through a sea change in the last three decades. Some of the old definitions applied to the ECM-ECCM effectiveness have proved to be inadequate.

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About the Book

This monograph presents material devoted to the art of Radar Electronic Counter Countermeasure. Modern Electronic Warfare encounters are very devastating and are terminal in deciding the course of a major conflict. Thanks to the all pervading computer technology and highly developed software support, Modelling and Simulation are the tools for the present day designers. The book represents the author's attempts in modelling the different aspects of Radar ECCM – the logic, the process and the controversy involved. It also dwells on the vagaries encountered in estimating and evaluating the efficacy of Radar ECCM solutions against ECM

About the Author

A.K. Subramanian has a doctoral degree in the field of Electronics and Communication Engineering and is a Fellow of the Institution of Engineers (India) and the Institution of Electronics & Telecommunication Engineers. He was with the Defence Research & Development Organisation, India, and served in various capacities over a period of 35 years. His interest has been evolving over the decades: RF Technology, Microwaves, Antennas, Radar System Engineering, Mathematical Modelling and Simulation, EMC, ECCM and Training aspects in high-tech areas. Presently, he is consultant to a number of organisations on Mobile Wireless Technology and also acts as educational consultant to many engineering

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