

Copyright is owned by the Author of the thesis. Permission is given for a copy to be downloaded by an individual for the purpose of research and private study only. The thesis may not be reproduced elsewhere without the permission of the Author.

**Could UAVs improve New
Zealand's Maritime Security?**

149.800

Master of Philosophy Thesis

Massey University Centre for Defence
Studies

Supervisor: Dr John Moremon

By: Brian Oliver

Due date: 28 Feb 2009

TABLE OF CONTENTS

List of Figures.....	iv
Glossary	v
Abstract	viii
Introduction	1
Chapter 1: New Zealand's Maritime Environment.....	6
The Political Backdrop.....	10
Findings of the Maritime Patrol Review.....	12
Maritime Forces Review.....	18
The current state of maritime surveillance	19
The National Maritime Coordination Centre.....	23
Chapter 2: The Value of New Zealand's Maritime Environment	29
Oil and gas production in New Zealand	29
New Zealand's Fisheries	34
Chapter 3: The New Zealand Strategic Environment – Current and future directions	40
New Zealand's Maritime Interests and Defence Policy.....	41
Features of the strategic environment and what lies ahead	43
Measures to protect and enhance maritime security	48
Aerial Surveillance – the options	48
Summary of strategic outlook.....	54
Chapter 4: Why UAVs?.....	56
UAVs – 100 years in the making.....	56
Classes of UAVs and features	58
Payloads not platforms.....	62
Command and Control	65
Chapter 5: Capabilities and Challenges – Is there a down side?.....	73
Background	74
Manpower and support.....	80
Other factors.....	86
Advantages of UAVs	91
Chapter 6: Operating UAVs in the National Airspace.....	95
Operating UAVs in New Zealand	95

Classification of UAVs	97
Sense and Avoid	99
Operator/Pilot Qualification	104
Chapter 7: Conclusions.....	111
Bibliography and References.....	118
Appendix A: Maritime Surveillance Aircraft and UAS referred to in the text	134
P3-K.....	134
Dash 8	135
King Air 350 ER	136
Predator A	137
Predator B	138
Global Hawk	139
Heron TP	140
Scan Eagle	141
RQ-11 Raven.....	142
Heron 1	143
Kahu 2-EB	144
Hawk.....	145
Camcopter	146

LIST OF FIGURES

<i>Number</i>	<i>Page</i>
1. New Zealand's EEZ	8
2. New Zealand's maritime area of responsibility	9
3. New Zealand's Continental Shelf.....	31
4. Pioneer UAV	57
5. A Predator UAS	60
6. The Interior of a Predator GCS.....	61
7. MQ-1C Sky Warrior.....	62
8. NanoSAR	63
9. Imagery generated by NanoSAR.....	63
10. Lynx SAR images	64
11. CoMPASS IV and LEV-2 EO turret	65
12. Skycam Kahu Silver-eye.....	66
13. The Layered Approach	71

Glossary

ACF	Air Combat Force
AP-3C	Lockheed Orion (maritime patrol aircraft - RAAF update)
APDC	Air Power Development Centre
ASW	Anti submarine warfare
ATC	Air Traffic Control
AV	Aerial Vehicle
BAMS	Broad Area Maritime Surveillance
BLOS	Beyond Line of Sight
BPC	Border Protection Command (Australia)
C ⁴	Command, Control, Communications, and Computers
C-130	Lockheed Hercules transport aircraft
CAA	Civil Aviation Authority (NZ or UK)
CAR	Civil Aviation Rule
CBP	Customs and Border Protection (United States)
CCAMLR	Convention on the Conservation of Antarctic Marine Living Resources
CDL	Common Data Link
CONOPS	Concept of Operations
COTS	Commercial off the Shelf
CPL	Commercial Pilot's Licence
Dash 8 (Q300)	Short range passenger aircraft converted for MARPAT
DB2K	Defence Beyond 2000 (report published 1999)
DoC	Department of Conservation
DoD	Department of Defense (United States)
DOP	Defence Output Plan
DPF	Defence Policy Framework (2000)
DSTO	Defence Science and Technology Agency (Australia)
DTA	Defence Technology Agency
EEZ	Exclusive Economic Zone
EO	Electro-optical
FAA	Federal Aviation Authority (United States)
FLIR	Forward Looking Infra-Red
GCS	Ground Control System
GDP	Gross Domestic Product
GDS	Government Defence Statement (2001)
HALE	High Altitude Long Endurance
HQJFNZ	Headquarters Joint Force New Zealand
ICAO	International Civil Aviation Organisation

IFR	Instrument Flight Rules
IPV	Inshore Patrol Vessel
IR	Infra Red
ISR	Intelligence, Surveillance and Reconnaissance
IUU	Illegal, unregulated, and unreported (fishing vessels)
JCCS	Joint Command and Control System
LCC	Life Cycle Costs
LOS	Line of Sight
LRE	Launch and Recovery
LRGCS	Launch and Recovery Ground Control Station
LTDP	Long Term Development Plan
MAF	Ministry of Agriculture and Forestry
MALE	Medium Altitude Long Endurance
MAOT	Multi-Agency Operations and Tasks
MARPAT	Maritime Patrol
MARSURV	Maritime surveillance
MAV	Micro (or miniature) Air Vehicle
MCC	Maritime Co-ordination Centre (now NMCC)
MDA	Maritime Domain Awareness
MFAT	Ministry of Foreign Affairs and Trade
MFish	Ministry of Fisheries
MFR	Maritime Forces Review (2002)
MMA	Multi-mission Maritime Aircraft
MNZ	Maritime New Zealand
MPA	Maritime Patrol Aircraft
MPR	Maritime Patrol Review (2001)
MRV	Multi-role Vessel
MSA	Maritime Safety Authority (now MNZ)
MTCR	Missile Technology Control Regime
NAS	National Airspace
NATO	North Atlantic Treaty Organisation
NMCC	National Maritime Co-ordination Centre
NORPAT	Northern Patrol
NPF	Naval Patrol Force
NWS	North West Shelf (Australia)
NZDF	New Zealand Defence Force
OEF	Operation Enduring Freedom
OEM	Original Equipment Manufacturer
OIF	Operation Iraqi Freedom
OPV	Offshore Patrol Vessel

P-3K	Lockheed Orion (maritime patrol aircraft – RNZAF update)
POC	Predator Operations Centre
PPL	Private Pilot's Licence
RAAF	Royal Australian Air Force
RHIB	Rigid hull inflatable boat
RMA	Revolution in Military Affairs
RNZAF	Royal New Zealand Air Force
RNZN	Royal New Zealand Navy
SAR	Synthetic Aperture Radar
SaR	Search and Rescue
SATCOM	Satellite Communications
shp	Shaft horse power
SLOC	Sea Lines of Communication
SMRPA	Short/medium Range Patrol Aircraft
SOI	Statement of Operating Intent
TCAS	Traffic alert and Collision Avoidance System
UA	Unmanned Aircraft
UAS	Unmanned aerial system
UAV	Unmanned aerial vehicle
UHF	Ultra High Frequency
UNCLOS	United Nations Convention on the Law of the Sea
UPT	Undergraduate Pilot Training
USAF	United States Air Force
USCG	United States Coast Guard
USN	United States Navy
USR	Unmanned Systems Roadmap 2007-2032
VFR	Visual Flight Rules
VHF	Very High Frequency
VUAV	Vertical take off and landing Unmanned Aerial Vehicle
WMD	Weapons of Mass Destruction

A b s t r a c t

In 2001 the *Maritime Patrol Review* (MPR) was published by the Department of the Prime Minister and Cabinet to determine the maritime patrol requirements of interested civilian government departments; such as Ministry of Fisheries, Customs, Foreign Affairs, Maritime Safety Authority, Police, Department of Conservation and others. The Review was driven by the planned \$600m sensor system upgrade to the RNZAF's P-3 Orion maritime patrol aircraft, which the new Labour Government saw no real justification for. The Review highlighted the poor state of maritime domain awareness in New Zealand in general, and of maritime aerial surveillance in particular. The threats to maritime security are many and include illegal fishing, drug smuggling, illegal immigration, terrorist activity, energy security, and transnational crime generally. The review concluded that a 10 times increase in aerial maritime surveillance was needed to meet the minimum requirements of the various government departments.

Eight years have now passed since The Review and it is timely to revisit the state of maritime domain awareness in New Zealand to assess what, if any, progress has been made. This thesis has found that there has been no increase in aerial maritime surveillance during the intervening period and that the NZDF is either unwilling or unable to fulfil government defence policy in respect to protection of New Zealand's Exclusive Economic Zone. Research indicates that the aerial maritime surveillance requirements of civilian government departments may have increased and that considerable gaps continue to exist in maritime domain awareness and thus maritime security. This thesis contends that UAVs provide a credible option to manned aircraft and bring a number of unique advantages. The need to increase maritime surveillance exists now, and with a potentially less stable global strategic situation together with a potential increase in off-shore energy activity, the need to plan for increased aerial maritime surveillance is compelling.

Brian Oliver

February 2009