A Comparison of Navigation by Visual Flight Rules and Global Positioning Systems for Aerial Baiting

Wild Dog Control in North Eastern New South Wales

By

Philip Graeme Gardner

A thesis submitted for the degree of Master of Resource Science at the University of New England Armidale NSW Australia

July 2010

Acknowledgements

I would like to gratefully acknowledge all those officers and staff of the Livestock Health and Pest Authorities, National Parks and Wildlife Service and the NSW Department of Primary Industries who helped and encouraged me through the long hours of this study and sensitive meetings with clients.

I would like to thank the staff at Fleet Helicopters in Armidale and Commercial Helicopters in Mudgee who went to great lengths to supply good quality data for the analysis.

A particular thank you to Gavin Melville, Barry Kay, Peter Fleming and Guy Ballard at NSW Department of Primary Industries for helpful analysis, ongoing support and encouragement.

Lastly, thank you to my wife, Lee, for her patience through another study and my children, James, Anna, Sarah and Matthew. I trust you will all achieve your dreams.

Certification

I certify that the substance of this thesis has not already been submitted for any degree and is not currently submitted for any other degree or qualification.

I certify that any help received in the preparation of this thesis and all sources used have been acknowledged in this thesis

Philip Graeme Gardner

Abstract

Navigation by Visual Flight Rules (VFR) or using topographic maps and visual clues of the landscape was compared with navigation using Global Positioning Systems (GPS) for aerial baiting for wild dog control in north east New South Wales from 2004 to 2009.

The Null hypothesis of this study was that there was no difference between VFR and GPS navigation when following aerial baiting transects for wild dog control. The study was replicated temporally with years 2004 to 2006 navigated by the traditional VFR method and 2007 to 2009 navigated using GPS.

To compare the two systems Geographic Information System (GIS) software was used to place the aircraft flight log overlay onto multiple ring buffers spaced at 100 m intervals from 0 m to 1000 m from the proposed bait transect. The proportion of the aircraft flight log within a given buffer interval was determined by using the Intersect function. The percentage of the aircraft flight log within each buffer interval was calculated.

Only 16.79 % of the aircraft flight log was within the 0 – 100 m buffer interval using VFR compared to 60.32 % using GPS. The maximum track error was reduced from greater than 1000 m to >90% within 300 m using GPS under operational conditions at 80 - 90 km / hr. Maximum track error of ± 300 m whilst achievable under ideal flying conditions was approaching the maximum expected of the current system under operating conditions where aircraft pilots, navigators and bait droppers may be unfamiliar with the location and terrain. Track error was reduced as operators learnt to use the GPS system.

The recommendation of this study is that:

1. Pilots should be trained in data logging of bait lines prior to an aerial baiting operation
2. Speed of operations should be the maximum necessary to maintain accuracy
3. To reduce operator error GPS data logging should be connected to a sensor in the drop tube of the aircraft so that the position of an object is logged to data storage each time it passes the sensor.

4. Those areas where GPS location errors may be present should be investigated by ground truthing the proposed bait transects.

5. An automated bait delivery device be designed and developed for aerial baiting of pest animals..

Table of Contents

List of Figures

List of Tables

List of Abbreviations

VFR	Visual Flight Rules
GPS	Global Positioning System
LHPA	Livestock Health and Pest Authority
NELHPA	New England Livestock Health and Pest Authority
CNLHPA	Central North Livestock Health and Pest Authority
MCLHPA	Mid Coast Livestock Health and Pest Authority
WDCA	Wild Dog Control Association
NSWDPI	New South Wales Department of Primary Industries
NPWS	National Parks and Wildlife Service