Chapter 47
Drones to the Rescue:
A Case Study of Cyclone PAM

Peter Tatham
Griffith University, Australia

ABSTRACT

This chapter considers the potential operation of long-range drones to support the logistic response to a natural disaster using a case study of Cyclone Pam that struck Tafea Province of Vanuatu in March 2015. It provides an overview of how the core capabilities of such drones might be employed in order to overcome the key challenge facing humanitarian logisticians responding to such disasters – namely that of understanding the 6W problem of "who wants what where when and why." The chapter then discusses the people, process, and technology issues that would need to be overcome in order to operationalize the concept.

INTRODUCTION

Drones – technically known as Remotely Piloted Aircraft Systems (RPAS) – are frequently used in a military context for both surveillance or attack, but are increasingly being employed in a number of non-military contexts including: the provision of aerial surveillance and mapping (Nex & Remondino, 2014), in the structural evaluation of buildings (Artemenko et al., 2014), in fire detection (Huang et al., 2011), in the provision of emergency communications (Tuna et al., 2014), and in the delivery of medical supplies (Holz, 2018).

Given the broad range of potential uses of such systems, it comes as no surprise that consideration is being given to their employment as part of the response to a disaster. In this regard, the American Red Cross (2015) recently concluded that: "Aerial drones are one of the most promising and powerful new technologies to improve disaster response and relief operations. … When a disaster occurs, drones may be used to provide relief workers with better situational awareness, locate survivors … perform structural analysis of damaged infrastructure, deliver needed supplies and equipment, evacuate casualties, and help extinguish fires – among many other potential applications." (p. 4).

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This Red Cross report also analyses previous cases where drones have been used in the aftermath of a disaster and suggests (p.7) that the most appropriate tasks are:

- Reconnaissance and Mapping
- Structural Assessment
- Temporary Infrastructure/Supply Delivery
- Wildfire – Detection and Extinguishing
- High-Rise Building Fire Response
- Chemical, Biological, Radiological, Nuclear, or Explosive (CBRNE) Events
- Search and Rescue Operations
- Insurance Claims Response and Risk Assessment
- Logistics Support

Furthermore, it has recently been suggested that annual sales of drones will surpass US$12 billion in 2021, which reflects a compound annual growth rate (CAGR) of 7.6% from the US$8.5 billion recorded in 2016 (Joshi, 2017). It is unsurprising, therefore, that the use of drones in support of the response to disasters is already taking place and is likely to expand. This is underlined by a recent report by the United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA) in which it was observed that: "[the] move from speculation to reality raises challenging questions around … how best to integrate [drones] into humanitarian response." (UNOCHA, 2014, p. 3).

It is also important to appreciate that there are significant capability differences between what are generically referred to as drones – in particular in respect of their endurance, speed and normal operating altitude. Whilst there is, as yet, no standardised classification system, that used by the United States Department of Defense offers an overview (Table 1).

Table 1. Drone Classification according to the US Department of Defense

Group	Size	Max Gross Take-Off Weight (Lbs)	Normal Operating Altitude (ft)	Airspeed (Kts)
Group 1	Small	0-20	<1,200 AGL*	<100
Group 2	Medium	21-55	<3,500	<250
Group 3	Large	<1320	<18,000 MSL**	<250
Group 4	Larger	>1320	<18,000 MSL	Any airspeed
Group 5	Largest	>1320	>18,000	Any airspeed
*AGL = Above Ground Level **MSL = Mean Sea Level				

Source: US Army (2010)

In practice, however, the use of drones in a disaster response context has mainly been limited to short range micro or mini variants (i.e. US DoD Group 1) such as those documented in a number of recently published case studies (UAViators, 2016). Whilst these case studies clearly demonstrate that such micro/mini drones have provided significant benefit to the responding agencies (and, hence, the