Chapter 109
The Efficacy of Aerial Search during the Battle of Midway

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ABSTRACT

The Battle of Midway (June 4 – 6, 1942) is considered one of the pivotal naval encounters of the Second World War. The battle has been examined in detail within both popular and scholarly literature, and a common opinion found in virtually all of these examinations is that Japanese search efforts on the morning of June 4, which were intended to determine if any U.S. naval forces were present, were inadequate. Japanese search procedures have been criticized on many separate grounds, but one fault implicit in many of these criticisms is that Japanese search plans were based upon the assumption that a searching aircraft that came within a predefined range of an enemy surface ship would inevitably sight that vessel. Intuitively, a 100% detection rate seems highly unlikely. It seems more probable that a myriad of factors influence detection probability, including characteristics of cloud cover, number and sizes of surface ships involved, relative courses, and speeds of the search aircraft and surface ships. This study employed a Monte Carlo approach built around modified GIS viewshed analyses techniques to investigate the influence of these and other factors had upon detection probability.

INTRODUCTION

The Battle of Midway was a major World War II naval conflict fought between the Imperial Japanese Navy (IJN) and the forces of the U.S. Navy (USN), U.S. Marine Corps (USMC), and U.S. Army Air Forces (USAAF). Taking place not quite six months after the Pearl Harbor attack[1], the Battle of Midway is considered by most historians to mark the end of the period of Japanese expansion throughout the Pacific and the beginning of the period where military initiative was held by the U.S.

The Battle of Midway is considered noteworthy for a wide variety of reasons, not the least of which is the fact that even though Japanese forces were superior in number to those of the U.S., the Japanese suffered a resounding defeat. There are many reasons for this, and the literature is full of

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often conflicting views of the relative importance of the various factors that contributed to the U.S. victory (Parshall & Tully, 2005; Fuchida & Okumiya, 2001; Prange *et al*., 1983). This debate is not germane to the current study. Regardless of where it ranks in the hierarchy of causes of the Japanese defeat, one cause was undeniably the failure of the Japanese search procedures that took place on the morning of June 4. These search procedures did not find the U.S. fleet until after U.S. forces had located the Japanese. This failure allowed U.S. forces to strike first, and during this first strike they delivered a fatal blow to the Japanese. Three of the four aircraft carriers that formed the heart of the striking power of the Japanese fleet were destroyed, and even though subsequent strikes by the Japanese were able to hurt the American forces (ultimately, the U.S. lost one aircraft carrier and one destroyer), after this first strike the ability of the Japanese fleet to achieve its objectives of capturing Midway Island and destroying the U.S. fleet was at the very least seriously degraded, and arguable was lost outright. This was proven by the final stages of the battle, where the Japanese lost one additional aircraft carrier (for a total of four), had one heavy cruiser sunk and a second severely damaged, and had to retire from the scene of the battle without seizing Midway Island and leaving the U.S. fleet largely intact.

The purpose of this study was to examine one aspect of Japanese search procedures used on June 4; specifically, the likelihood that Japanese search aircraft would be able to spot U.S. warships if they came within visual range of those warships. Before this purpose can be achieved, a review of maritime search procedures of the period is in order.

MARITIME AERIAL SEARCH DURING THE BATTLE OF MIDWAY

The idea of conducting searches for enemy warships from aircraft launched from friendly ships was not entirely new in World War II; such searches were conducted during and after the First World War. However, rapid improvements in the capabilities of search aircraft (primarily in terms of range, speed and endurance – the amount of time an aircraft could remain aloft), increases in the number of aircraft available (significantly through expanded complements of seaplanes on battleships and cruisers, but more dramatically through the proliferation of aircraft carriers), and improved aircraft-to-ship communications (through improvements in radio technologies) exponentially enhanced the aerial search capabilities available to naval commanders immediately prior to and during World War II. Given this revolutionary improvement in technological capabilities, it is perhaps not surprising that in 1942, naval commanders were still struggling to develop techniques to employ their newfound search capabilities to their best advantage. The USN's primary contemporary doctrine and tactical documents on the subject (U.S. Navy, 1942, 1941a, 1941b) are rather imprecise, and occasionally contradictory. These documents do not lay out a single, definitive search strategy, probably because it was recognized that no ideal, universally applicable search strategy existed. Few Japanese doctrine or tactical manuals from the time survived the war, but one that did was written in November of 1941 and endorsed by the commander of IJN Carrier Division Four (Imperial Japanese Navy, 1941)[2]. At the time of the Battle of Midway, this division, composed the light carriers *Ryùjō* and *Junyō*, (which carried roughly 30 aircraft apiece – fleet carriers of the time carried at least twice that number) was in the northern Pacific engaged in a diversionary action in the Aleutian Islands and thus not directly engaged in the battle near Midway Island (Parshall & Tully, 2005). The short tactical manual endorsed by Carrier Division Four's commander contains five diagrams describing aerial search procedures with two, three and four aircraft. These searches were clearly intended for intensive searches of small areas (for example, to confirm or refute a