DAUNTLESS IN PEACE AND WAR

A PRELIMINARY ARCHAEOLOGICAL AND HISTORICAL DOCUMENTATION OF DOUGLAS SBD-2 DAUNTLESS BuNo 2106,

MIDWAY MADNESS

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Abstract

This report focuses on a Douglas SBD-2 Dauntless Scout Bomber, specifically, U.S. Navy Bureau of Aeronautics (BuAer) aircraft serial number, known as a Bureau Number in Naval circumstances, (BuNo) 2106. The Navy awarded many contracts to the Douglas Aircraft Company at El Segundo, California, in 1940. The Douglas Dauntless/Banshee design was one of these contracts. It was conceived through the combined efforts of aeronautical engineers John K. Northrop, Ed Heinemann, and Donald Wills. This aircraft played a significant role in many of the Allied tactical and strategic successes in the Pacific Theater of Operations, ultimately emerging as one of the most important and successful aircraft designs of the Second World War.

Discovered in October, 1993 on the bottom of Lake Michigan, the submerged but well-preserved wreck of BuNo 2106 was recovered in January 1994, by A & T Recovery, for the National Museum of Naval Aviation (NMNA). The Naval Historical Center (NHC), in cooperation with the National Museum of Naval Aviation and the Institute of Nautical Archaeology (INA) conducted a preliminary archaeological and historical documentation of the aircraft.

Research shows that BuNo 2106 is an aircraft that is not only rare, but also possesses unusual historical significance. Of the 87 SBD-2 models built known by Douglas, this is the only model that presently survives intact for study. The wrecks of four others, BuNos 2111, 2117, 2183, and an unidentified SBD-2, still remain in Lake Michigan. In terms of historical interpretation, BuNo 2106's significance transcends its rarity as a model.

The aircraft was initially assigned to Bombing Squadron TWO (VB-2), assigned to one

of the Navy=s first aircraft carriers, the *Lexington* (CV-2). BuNo 2106 operated from *Lexington* wearing the side code 2-B-2 during most of 1941 and early 1942. An important exception in this timeline was a *Lexington* cruise, in which the Dauntless was left at Naval Air Station (NAS) Ford Island, Territory Hawaii on 5 December 1941, to repair engine damage incurred during the 1941 Army-Navy General Headquarters (GHQ) maneuvers in Louisiana. As a result, this aircraft was present for, and survived, the Imperial Japanese Navy's devastating carrier-based raid on the U. S. Navy Pacific Fleet at Pearl Harbor, 7 December 1941. After the attack BuNo 2106 rejoined *Lexington* with a new powerplant on 12 December 1941. While still with *Lexington*, BuNo 2106 participated in early Pacific Fleet wartime operations, including the 10 March 1942 trans-montane Lae-Salamaua Raid. During the raid, LT (jg) Mark Twain Whittier and radioman-gunner ARM2 Forest G. Stanley flew BuNo 2106. Whittier received a Navy Cross for his actions in this engagement.

When *Lexington* sailed for the South Pacific in late April 1941, BuNo 2106 again remained behind at Pearl Harbor=s aircraft pool, this time for reassignment. It was a fortuitous occurrence for BuNo 2106, as *Lexington* never returned, lost in the Battle of the Coral Sea, along with all but five of the Dauntlesses assigned to its VB-2 squadron. [1] Instead of suffering a similar fate, BuNo 2106 was carried to Midway Island in May for the purpose of strengthening the U.S. Marine Corps' Scout Bombing Squadron TWO FORTY ONE (VMSB-241) in preparation for the Japanese offensive that Naval intelligence agencies were anticipating. On 4 June this Dauntless, wearing the side code of 6, an abbreviated form of 241-MSB-6, and manned by 1stLT Daniel Iverson, Jr., pilot, and PFC Wallace J. Reid, radioman-gunner, participated in the decisive Battle of Midway. BuNo 2106 survived the costly Marine attack on the Japanese

aircraft carrier *Hiryu* that cost VMSB-241 half its Dauntlesses. This engagement resulted in both Iverson and Reid being wounded in action, and BuNo 2106 collecting at least 210, perhaps as many as 259, holes in its airframe from projectiles, as well as suffering further damage upon its return and crash landing on Midway. The Navy awarded Iverson with the Navy Cross and Reid with the Distinguished Flying Cross for their heroism during the mission.

Following Midway, BuNo 2106 underwent a complete overhaul and was sent to the Carrier Qualification Training Unit (CQTU) at NAS Glenview, Illinois. On 11 June 1943, while being flown by 2ndLT Donald A. Douglas, Jr. USMCR, during a routine carrier landing qualification flight, the aircraft stalled and spun into Lake Michigan. The Dauntless came to rest in 170 feet of cold, fresh water where it remained until its recovery 50 years later.

In addition to its rarity as an aircraft type and model, this Dauntless is believed to be one of only four extant aircraft, only two of which were naval aircraft, known to have been present during the Pearl Harbor attack. More significantly, BuNo 2106 is presently the sole surviving naval craft of any type, known to have played a role in the pivotal Battle of Midway.

At a time when the management of aviation cultural resources is only beginning to receive the focus the issue requires, the recovery of BuNo 2106 provides a unique case study in aircraft preservation and management. The NHC sought to document this historic American naval aircraft to provide a model for future research. Specifically this case study could provide a framework in terms of documentation methodology, conservation needs of submerged aircraft materials, ethical considerations, and the need to address aviation and aeronautical archaeological issues responsibly within existing federal cultural resource management guidelines. Although the aircraft's serial number was never found, this study confirms the

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1 The Battle of the Coral Sea was the first naval battle fought entirely by carrier-based aircraft offensives.

aircraft=s identity as BuNo 2106 using archaeological evidence gathered from the wreck, and supports this finding with data retrieved from primary and secondary sources. This research furthermore documents the aircraft as a significant historical resource and an archaeological artifact requiring conservation and preservation, and provides a catalog of consultable archaeological evidence for not only the long-term monitoring of this aircraft, but also for potential comparison in the event of future finds.

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1. Introduction: Project Inception and Research Parameters

Results from this study confirmed the identity of the U.S. Navy Douglas SBD-2 Dauntless BuNo 2106, and provides detailed archaeological material documentation. This report will serve as a methodological framework for documenting other significant archaeological naval aircraft. It also provides a model for future historical aircraft documentation efforts by other aviation museums and historical organizations facing similar needs. As the legal steward of archaeologically significant U.S. Navy and U.S. Marine Corps aircraft, the Department of the Navy will directly benefit from the development of such a methodology.

The project's field documentation phase extended from 13 to 24 March 1995 at the National Museum of Naval Aviation (NMNA) at NAS Pensacola, Florida. The project was originally envisioned as a comprehensive archaeological documentation of all of the aircraft's structural features and associated artifacts. The timetable for this phase initially included nine days of field photographic documentation and historical research, and three days of data collation, three days of analysis, and three days for composition of a basic structural documentation report. The documentation team consisted of the author as principal investigator, and David Grant as project photographer and archaeological researcher. The author made a subsequent trip to the museum to compare damage characteristics of other aircraft with BuNo

2106, several months later. This visit included Anne Lessmann as photographer. In addition to this report, the project also generated two articles that summarized the findings of the evaluation (Wills 1996a, Wills 1996b).

When the project team arrived, the restoration of BuNo 2106 was well underway. Therefore, in addition to improvising and developing research techniques, the examination was restricted to a two-week window because of the aircraft's long-term, ongoing treatment. Since original technical data and historical sources still existed in regard to the Dauntless, and with only a two week window of opportunity, the team decided to concentrate their efforts on determining any structural deviations from the typical, factory shipped model. Had the team been allowed unlimited access and funds, a more thorough investigation would have been ideal.

This project consisted of two phases: the first included documentation of the aircraft's physical features, as well as the collection of primary and secondary resources. This phase provided an opportunity to develop and explore potential methods for documenting an aircraft as an aircraft is a highly complex composite artifact. The second phase consisted of data processing, which led to the assembly of a final structural documentation report, archaeological analysis, and photographic catalog. All methods of investigation were non-intrusive.

In summary, this report provides the basic history of the aircraft as a type and a model, including the current restoration phase, a documentation of the aircraft's initial condition upon recovery, a structural assessment, and analysis of identified construction features that deviate from expected structural characteristics. Since the restoration is an ongoing project, the report's structural evaluation section is incomplete. This report reflects a two-week portion of an effort that may ultimately take several years to finish. Following restoration, an appendix should be

added by the NMNA that provides an index of all alterations and treatments.

2. The Northrop BT and Douglas SBD Dauntless/A-24 Banshee Scout Bomber Series

At the outset of America's involvement in the Pacific Theatre in 1941, both the U.S. and Japanese fleets principally used the dive-bomber aircraft for their carrier-based strike force. In the U.S. Navy, this aircraft was the Douglas SBD Dauntless, which would continue service throughout much of the Second World War. It was the SBD-2, in particular, that the U.S. Navy utilized in the crucial first few months of the war. Despite a number of inadequacies inherent in the model, the SBD-2 managed to "hold the line" in this carrier based war

The Dive-Bomber Concept in Naval Strategy

By both the U.S. Navy and the Imperial Japanese Navies had been using carrier aviation for approximately 20 years. Naval aviation historian Barrett Tillman sums up the parallel development of carrier aviation within these two countries in the following manner:

> Both had evolved essentially the same three classes of aircraft types since *Langley* and *Hosho* began their initial trials two decades previously: single-seat fighters, two-seat dive bombers, and three-seat torpedo planes. Though technical doctrine and technological progress differed to varying degrees, the six primary [aircraft type] combatants at Midway shared a similar heritage (Cressman et al 1992, 206).

The corresponding designs for this generation of Japanese aircraft emerged between 1935 and 1938. The Mitsubushi A6M2 Type 00 (AZero≅) carrier fighter, the Aichi D3A1 Type 99

(AVal≅) carrier bomber, and the Nakajima B5N2 Type 97 (AKate≅) carrier attack plane, were the incarnation of these types. These successful designs underwent a successful initial trial in attacks on China (Cressman et al 1992, 206).

American's counterparts at this time were the Grumman F4F Wildcat carrier fighter, the Douglas SBD Dauntless carrier scout bomber which fulfilled both the scouting and bombing roles, and the Douglas TBD Devastator carrier torpedo plane. The F4F Wildcat provided a much-needed replacement for the obsolete Brewster F2A Buffalo, while the SBD arrived in time to replace the Curtiss SBCs, Vought SB2Us, and Northrop BT-1s. The TBD, the oldest member of the three principal aircraft types in service in early 1942, although largely considered obsolete, remained in use because of production delays in Grumman=s TBF program. The TBD had been the first all metal folding-wing monoplane in fleet service, but after 1935 advancement of technology caused the TBD to lag behind, soldiering on beyond its initially projected service life, despite signs of inadequacy, because it was all that was available. As these types became common in fleet service, replacements for them were already under development in the form of the Grumman F6F Hellcat, the Vought F4U Corsair, the Curtiss SB2C Helldiver, and the Grumman TBF Avenger. However, this next generation of naval aircraft would not be available in large numbers until after the first six months of combat. In short, the success or failure of America=s opening phase of the Pacific Theatre would rest upon these F2As, F4Fs, TBDs, SB2Us, and SBDs.

The German Luftwaffe proved the tactical advantages of the dive-bomber against land targets as early as 1939. The Junkers Ju.87 Stukas of the German Luftwaffe, early variants of which had been battle tested in the Spanish Civil War, and which were used with great success

against Allied forces in Europe, especially during the French Campaign were the weapon of choice (Cunningham 1943, 205). The success of the Stukas impressed the U.S. Army Air Corps with the need to develop a land-based dive-bomber (Stern 1988, 17). The Douglas A-24 Banshee variant of the SBD Dauntless filled that need.

In comparison with traditional land-based aircraft requirements, the numerous demands of carrier-based aircraft required unusual adaptations. Carrier-based aircraft required arresting hooks, catapult fittings, more corrosion-resistant paint coatings, and in general a more durable construction than that required for their land-based counterparts (Maynard 1962, 42). Ruggedness was required for what in the course of routine carrier operations basically amounted to repetitive controlled stalls and abrupt crash landings. These peculiar operating needs forced Douglas and other Navy contractors to deal with the problem of increased gross aircraft weight. Furthermore, Douglas decided to confront, within the same Dauntless design, the different requirements necessary for the missions of both bombing and scouting. Donald Douglas expressed his fundamental philosophy regarding aircraft construction as follows:

> Navy planes take a beating. They slam down on the carriers when they land and get roughed up by the unforgiving elements of the high seas. If we want the Navy to buy our planes we must build them rugged (Rausa 1982, 27).

In his memoirs, retired naval aviator Mark Whittier, who flew SBD 2106, offers a good description of the basic mechanics involved in operating an aircraft from the deck of a moving vessel during the heyday of the dive bomber:

> Operating on and off the carrier became a piece of cake--something only a few hundred men in the United States could do. Take-offs were always "fly-aways" with 15-20 seconds between planes. The

> roll and pitch of the deck had a tendency to change your direction speed or slow you down a bit, but once you got the hang of it timely corrections in control kept you right down the center. With the SB2U it took about 65 knots of wind across the wing to get airborne and whether this came from the forward pull of the propeller through still air or a hurricane with no power or the wind from the ship's forward motion plus wind over the water--at that magic figure sixty-five knots you were flying. So most of the time you could expect twenty knots from nature, twenty knots from the *Lex* and your twenty-five knots of engine power took you a little ways down the flight deck and you were aloft! (Whittier 1992, 23-24).

Upon his assignment to VB-2 in 1938, Whittier recalls the aircraft in use by the squadron at that time, the Vought SB2U Vindicator:

> The SB2U aircraft (Scout Bomber 2nd model made by Vought Aircraft coded "U") was the fastest plane in the fleet and there were 18 of them in the squadron. A beautiful looking aircraft, it was much like a shark with a slender body tapering back to a tall tail. The crew was two, pilot and rear seat gunner and whenever you flew with no one in the rear a couple of sand bags were strapped into the aft bucket seat for weight and balance. As I say, the aircraft was fast and would cruise at perhaps 145-150 knots, landing speed 65-68 knots, but that was as far as the desirability of the SB2U went. A DIVE bomber it wasn't; the wing structure just would not withstand the terrific stresses of the pull out from a dive. The plane was sleek and fast so that it dived like a streak of lightning; I've seen 400 knots on the air speed indicator in a prolonged dive and watched the "G" forces at pull-out put big waves and wrinkles in the wings, some so large your forearm would fit in the trough. Back in level flight the wing would smooth out but often leaving telltale creases in skin surface foreboding something more serious within.
>
> Finally the plane was restricted to level flight only and we became known in the fleet as "the dive bombless dive bomber squadron." Design studies showed that the wings just would not withstand the speeds our tactics called for, and with dive brakes or flaps unheard of, a temporary expedient of extending the landing gear for the dive was used. It slowed the dive but ruined the flight characteristics so that the vertical dives gave way to glides with a complete loss in tactical efficiency (Whittier 1992, 19).

With its many design improvements, the Dauntless soon replaced the Vindicator as the Navy bombing and scouting workhorse, and defined the properly utilized dive bomber concept. Upon its introduction into service, the SBD was considered a successful aircraft design, embodying a number of unique innovations that enabled the U.S. Navy to improve the tactical art of dive bombing (Smith 1981). Due to its improved angle of steep overhead attack, the Dauntless presented a more difficult target to hit, allowing attack in a shorter amount of time. Opposing fighter pilots often could not keep up with a dive bomber after it had extended its

speed brakes and nosed over.

The SBD Dauntless usually flew bombing strikes with a 1,000 pound bomb in the crutch beneath the plane's center section, and two 100 pounders in the wing shackles.2 On scouting missions it was armed with only a 500 pounder on the centerline rack, since the decreased weight allowed for long-range searches. At an altitude of 15,000 feet, the routine for a dive bombing exercise was to pull back the throttle and split the perforated dive flaps, after which the pilot would set the propeller into full pitch, switch the mixture to full rich, and turn on the carburetor heat. After putting the stick forward to start the dive, the pilot would Apush over≅ into a vertical dive, using the ailerons for course correction and trimming the craft as its speed increased. The eighteen aircraft within a squadron would be organized into multi-ship groups, and would usually fall at about 150-foot intervals during the course of a dive. The pilot maintained a dive angle of approximately 70 degrees or more, thereby retaining excellent control over the aircraft in the course of the typical 40-second dive. Often the radioman-gunner called out the declining altitude every 1,000 feet. At 3,500 feet the pilot usually pulled back on the stick and started to look for an aiming point through the telescopic sight, centering upon the target. When at 1000 to 2000 feet the pilot would pull the bomb release, after which he quickly "flattened out the ship," by this time at about 500 feet, pushed the throttle Ato the firewall,≅ switched off the carburetor heat, adjusted the trim for the sudden weight loss of the bomb, and got away fast. Although the SBD could adequately defend itself against fighters, pilots preferred evasion to confrontation, as interception and pursuit were not the primary mission of the Dauntless (Cressman et al 1992, 104-105, 206-209). Specific accounts and pilot personal

2 Occasionally referred to as the "barge" or "Slow But Deadly."

experiences in naval dive bombing can be found in Winston (1939), Dickinson (1942), Moore (1943), Buell (1991), Lundstrom (1976a; 1976b), and Whittier (1992).

Although already scheduled for retirement when the United States entered the Second World War, a Dauntless obtained the distinction of sinking the first Japanese naval vessel of the war when LT Clarence E. Dickinson of the *Enterprise*'s VS-6 sank the submarine *I-70* on 10 December 1941 (Stern 1984, 10; Dickinson 1942). The SBD was ultimately credited with having sunk more enemy shipping during 1942, a crucial year in the Pacific Theater, than all other aircraft combined. BuAer Chief RADM John S. McCain described the Dauntless as having Asunk more enemy combatant tonnage than all other branches of the service≅ (Maynard 1962, 47). In particular, the Dauntless was credited with destroying no less than six Japanese aircraft carriers (Tillman 1976, 41) and sinking 130,000 tons of shipping, while sharing 50,000 more "kills" with torpedo carrying aircraft. This total was nearly equal to 30 percent of Japan's prewar naval strength in capital ships (Tillman 1976, 161).

The Dauntless/Banshee3 design performed a central role in actions focused around the Marshall and Gilbert Islands, Wake Island, Marcus Island, at Lae and Salamua, the Coral Sea, Midway, the Solomons, the Marianas, the Philippines, as well as Atlantic duty, North Africa and Norway (Ingells 1979, 62). The SBD was the only U.S. aircraft type to fly from carriers in all five of the naval engagements fought exclusively between carrier forces in the entire course of naval history (Stern 1964, 4; Tillman 1976, 206). In addition, the SBD achieved the lowest loss-rate of any American carrier-based aircraft type during the entire war, an accomplishment attributed to its superior design, and rugged construction (Tillman 1976, 208). Tillman

3 Banshee was the name given to the SBD's land-based variant, the A-24.

characterizes the Dauntless as Aone of the finest antiship aircraft of World War II≅ (Cressman et al 1992, 206). One of the lesser-known, but notably unique achievements of the SBD, was its participation in a successful experiment as the first aircraft to use tricycle landing gear in a carrier landing (Cunningham 1943, 205). This type of undercarriage arrangement has since become standard in naval aviation.

BT, SBD, and A-24 Production

The BT/SBD/A-24 series was manufactured as a collaborative effort by the designers of Northrop (1934-1939) and Douglas (1939-1944). The series included Northrop=s XBT-1, BT-1, and XBT-2 models; and Douglas= SBD-1, -2, -3, -3A, -4, -4A, -5, -5A, and -6 models and their prototypes, modifications, and A-24 variants.

The history of Northrop, Douglas, and McDonnell-Douglas is discussed in Cunningham (1943), Maynard (1962), Ingells (1979), Francillon (1988-1990), and Morrison (1991). Biddle (1991) provides an excellent review of the role of Douglas Aircraft in the larger picture of the early American aerospace industry. The history and development of the Dauntless in particular is discussed in Brazelton (1967), Tillman (1976), and Stern (1988).

Aeronautical engineers John Knudsen Northrop, Edward Heinemann, and Donald Wills figured most prominently in the development of the SBD. John K. AJack≅ Northrop began his career at 16 as an aviation draftsman for the Loughead (or ALockheed≅) Brothers during their initial construction of flying boats. After service in the First World War, Northrop went to work in the engineering department of Donald W. Douglas=s Douglas Company (now McDonnell-

Douglas). He left Douglas in 1927 to help form what became the Lockheed Corporation (now Lockheed-Martin), where he proved instrumental in the production of the Lockheed Vega and the Northrop "Flying Wing" (Cunningham 1943, 197-198). In 1932 Northrop left Douglas to form his own company, with Donald W. Douglas=s backing. Located in El Segundo, California, Northrop became a subsidiary of Douglas Aircraft. Jack Northrop was a brilliant aviation visionary who during this period introduced, among other things, the first all-metal stressed-skin monoplane (Stern 1988, 4).

In 1934 the Bureau of Aeronautics, (BuAer) circulated a request for proposals for a new purpose-built dive-bomber to replace the various less desirable aircraft types that were then serving in the fleet dive-bomber role. Northrop subsequently submitted a design proposal outlining an all-metal, stressed skin, low-wing monoplane design that combined both a scouting and a bombing capability into the same versatile aircraft. The Northrop entry into the contract bidding process not only embodied an all-metal airframe with semi-monocoque frames, but also possessed Jack Northrop's brilliant sparless, multicellular wing design. BuAer chose the Northrop design over five other entries and ordered a single prototype under the designation AXBT-1≅ (Stern 1988, 4). BuAer assigned the sole Northrop XBT-1 the serial number 9745, known as a Abureau number" within the Navy (Van Vleet et al 1970, 346; Larkins 1988, 358; Stern 1988, 4). On 18 November 1934 the Navy awarded a contract to Northrop for the XBT-1, Aa two-seat scout and 1,000-pound dive-bomber."

The XBT-1's first successful flight was in August of 1935 (Van Vleet et al 1970, 308-309). The Navy Department initially envisioned the BT design as not only a surface carrier-based bomber, but also as the prime candidate to operate from the next generation of aircraft-

carrying rigid airships that were still under serious consideration. While the next class of dive bomber-carrying rigid air ships never materialized, the BT did, and BuNo 9745 became the prototype in the sequence from which the SBD series emerged, and from which a total of 4,923 SBDs and 1,013 A-24s ultimately derived (Tillman 1976, 217). The table on pages 13 and 14 displays a simple model-by-model progression and serial production breakdown of all BT, SBD, and A-24 aircraft, compiled from data in Van Vleet et al (1970); Tillman (1976); Andrade (1979); Larkins (1988); and Stern (1988).

Ed Heinemann designed the XBT-1 prototype under Jack Northrup's direct supervision. The XBT-1 was originally equipped with a 700 horsepower Pratt & Whitney (P&W) R-1535-66 Twin Wasp Jr. powerplant, but it was redesigned with an 825 hp P&W R-1535-94 Twin Wasp Jr. that provided an improved top speed of 212 mph and a higher service ceiling of 22,500 feet when fully loaded. Over the course of subsequent design stages, alterations were made in the dimensions and configuration of the powerplant, dive flaps, canopy, undercarriage, wings, propeller, tail, and rudder. Stern (1988, 4-5) offers a good description of the stages of aircraft design, testing, problems, evaluation, and redesign. In 1938 Northrop resigned leaving Douglas in control. As a result, the manufacturer=s designation letter was changed from T (Northrop) to D (Douglas). For a detailed analysis of the features and characteristics of the XBT-1, see Brazelton (1967), Tillman (1976), and Stern (1988).

The BT-1 differed from the XBT-1 in a number of ways. BT-1s and subsequent SBD-1 and -2 models were manufactured with a 1,000 hp Wright Aeronautical Corporation (WAC) XR-1820-32 Cyclone powerplant. However, despite being redesigned and fitted with partially retractable landing gear, the aircraft suffered from lateral instability, loss of rudder and a loss of

aileron effectiveness at low speeds. The BT-1 also had a tendency to snap-roll with given a sudden increase in power. Holes drilled in the flaps and dive brakes solved the XBT-1's buffeting problems (Stern 1988, 4). The Navy ordered a total of 54 BT-1s, consisting of BuNos 0590-0626 and 0628-0643 (Van Vleet et al 1970, 346; Stern 1988, 4). Although the number sequence totals 54 aircraft ordered, a production block resulted in no number 0627 being built. The unit 0627 was most likely modified into the single XBT-2/XSBD-1. BuNo 0627 is recorded as being the only Northrop XBT-2 constructed. Douglas subsequently redesignated this plane as the Douglas XSBD-1 following the realignment of the Northrop company (Van Vleet et al 1970, 346; Tillman 1976, 217; Andrade 1979, 221; Stern 1988, 5).

Some characteristics of the plane remained the same while a few changes were also made. For instance, the stronger powerplant design of the BT-1 was retained in the XSBD-1, but the two-bladed propeller was replaced with a three-bladed adjustable pitch model. Also the control panel and instrumentation were completely redesigned. The National Advisory Council on Aeronautics (or NACA, the forerunner of NASA) tested the XBT-2/XSBD-1 in its wind tunnel facility, and a number of aerodynamic alterations were introduced.4 These changes included fully retractable landing gear, a redesign of the old fairing configuration, a series of fixed anti-stall slots in the wings to increase aileron effectiveness, a new tail and rudder configuration, and a completely redesigned Agreenhouse≅ type canopy structure (Stern 1988, 5). The first BT-1 models were delivered to *Yorktown*'s VB-5. Ultimately, only the air groups aboard *Yorktown* and *Enterprise* utilized the BT-1.

The initial production model BT-2/SBD-1 underwent more design changes. Its cowling

4 This wind tunnel facility was the first ever created.

profile was altered to add a large carburetor air scoop, a spinner was added to the propeller hub, and the wooden radio mast was moved to just forward of the firewall. Armament was added in the form of two removable fixed, forward-firing, .50 caliber, Browning machine guns, and one flexible .30 caliber, Browning machine gun in the radioman-gunner's station. The .30 was stowed in a dorsal well beneath hinged compartment covers, and unshipped by the gunner when needed by steeping hard on a foot pedal. A forward-swinging, centerline, bomb crutch was introduced, which when combined with the two wing shackles, brought the total payload capacity to 1,200 pounds. Unfortunately the range of the BT-2s and SBD-1s proved too short for their intended role. The plane's fuel capacity was only 210 gallons, carried in four tanks in the wing center section, of which the two main ones held 90-gallons, and the other two held just 15. This slight fuel capacity provided a maximum range of less than 900 nautical miles with a full payload, which when tactically interpreted as a combat radius, equaled approximately 200 nautical miles. There was no armor protection for either the crew or the fuel tanks.

Douglas constructed 57 SBD-1s and -1Ps for USMC service.5 A total of 144 SBD-1s were initially ordered, of which only 57 (BuNos 1596-1631 and 1735-1755) were actually constructed (Van Vleet et al 1970, 347; Andrade 1979, 221). The remaining 87 were ultimately configured as SBD-2s. The Navy halted production on the SBD-1s as they were Aless than combat ready." Delivery began June 1940 (Tillman 1976, 217). Of these, the Marines received nineteen, and the remainder went to the Navy (Larkins 1988, 360). Eight of these were converted for photographic reconnaissance use and redesignated as ASBD-1Ps≅ (Andrade 1979, 221).

5 The suffix "P" indicated modification for a photographic reconnaissance mission.

A total of 87 SBD-2s were built, bearing the BuNos 2102 to 2188 (Van Vleet et al 1970, 347; Andrade 1979, 221; Stern 1988, 10). SBD-2 models were essentially the same except for several isolated instrument upgrades in the course of the assembly line progression that included the introduction of an autopilot mechanism. The SBD-1s two 15-gallon auxiliary tanks were eliminated in favor of 65-gallon wing tanks installed in the outer wing panels. This modification increased fuel capacity to 310 gallons, and increased the SBD-2's maximum range to 1200 nautical miles. However, to compensate for the heavier fuel load, one of the fixed .50 caliber guns was often removed for long-range missions, decreasing defensive capability. The SBD-2 still lacked protective armor for the fuel system and crew. Exterior alterations consisted of a reduction in the size of the carburetor air scoop on the upper cowling. Delivery began in November 1940 (Tillman 1976, 217). Fourteen of the SBD-2s were converted for photographic reconnaissance use and redesignated as SBD-2Ps. Larkins raises a possible discrepancy with the SBD-2 model run as his numbers indicate only 86 produced, and that BuNo 2109 was an SBD-3 (Larkins 1988, 361). The two U.S. Navy memoranda from the head of the BuAer concerning allocation and reallocation of the SBD-2 airplanes acquired under contract 65969 identify BuNo 2109 as an ASBD-2≅ that was ultimately destined for *Lexington* (CV-2) along with the rest of the 2105-2122 sub-block (Message, Chief, Bureau of Aeronautics to Commander Aircraft, Battle Force, AUSN Bureau of Aeronautics Allocation of SBD-2 Airplanes, Contract 65969, 9 April 1940; Message, Chief, Bureau of Aeronautics to Commander Aircraft, Battle Force, AUSN Bureau of Aeronautics Reallocation of SBD-2 Airplanes, Contract 65969, 15 October 1940). However, the erection and maintenance (E&M) manual for the SBD-2 model series points out in its introduction that it applies to the aircraft Amanufactured in accordance with Contract 65969-

Navy, bearing serial numbers from 2102 to 2108 and 2110 to 2188 inclusive,≅ thus eliminating any reference to BuNo 2109 (Douglas Aircraft Company, Inc. 1941, introduction). According to Francillon, the eighth production SBD-2, BuNo 2109 (Douglas airframe construction number 635), crashed during corporate acceptance trials, necessitating a replacement with SBD-3 c/n 1003 (Francillon 1988, 256-257). The serial number 2109 was reassigned to the replacement aircraft, resulting in the unusual situation of two different aircraft possessing the same BuNo.

Four more SBD models were produced, each an improvement over the last. Range, armament, armor and overall improvements to the design followed until the Curtis SB2C Heldiver replaced the Dauntless in the latter years of the war. But due to a number of design problems, poor handling characteristics, and the fact that the large, ungainly Helldiver offered little improvement over the much-loved Dauntless, many Helldiver pilots yearned for the return of the SBDs (Tillman 1976: Dub Lemmons, personal communication to Rich Wills, 1995).

3. The Operational History of SBD-2 Dauntless BuNo 2106

BuNo 2106's history can be reconstructed by analyzing many primary and secondary sources. Among these are: the USN BuAer allocation and reallocation directives for the SBD-2 aircraft produced and purchased under Contract 65969; the aircraft's individual BuAer Aircraft History Card; Whittier's privately printed memoir *Instead of Becoming a Doctor* (1992); Whittier's short 1994 monograph *SBD-2 BuNo 2106, as Two-Baker-Two* (1994); Whittier's flight log; Whittier's 1994 correspondence with NMNA; VMSB-241 unit records; the craft=s BuAer aircraft trouble analysis report summary card; primary photographic evidence consisting of one probable image of the aircraft and its pilot taken during its time in VB-2 and three pictures of the aircraft (one with its pilot) displaying its extensive damage taken following the Battle of Midway; through comprehensive structural analysis of the aircraft itself; and by locating and examining particular associations mentioned in historical literature relating to the Second World War. Such secondary sources that refer to this particular craft include, but may not be limited to, Casey (1942), Johnston (1942), Moore (1943), Heinl (1947), Morison (1950), Sherrod (1952), Stafford (1962), Lundstrom (1976), Tillman (1976), Prange (1982), Cressman et al (1992), and Cressman (1994). The original aircraft maintenance logs are not available. A search for additional aircraft flight logs of squadron personnel is feasible, but lies outside the scope of this research.

1940: Construction and Allocation

On 9 April 1940 the Chief of the BuAer signed an order allocating Douglas SBD-2s BuNos 2103 to 2120 to VS-5 of the *Yorktown* Air Group (Message, Chief, Bureau of Aeronautics to Commander Aircraft, Battle Force, ASBD-2 Airplanes, Contract 65969, Allocation of,≅ 9 April 1940). Because of production delays, on 15 October 1940, Captain Marc Mitscher, Acting Chief of BuAer, reallocated BuNos 2105-2122 to the *Lexington's* Air Group VB-2 (Message, Chief, Bureau of Aeronautics to Commander Aircraft, Battle Force, ASBD-2 Airplanes, Contract 65969, Reallocation of,≅ 16 October 1940). BuNo 2106's Aircraft History Card indicates that on 28 December it left El Segundo for San Diego, arriving at its destination on 30 December. The Aircraft History Card also indicates that it was equipped with a factory-installed Wright Aeronautical Corporation R-1820-32 Cyclone radial engine, WAC serial number 4689. Mark Whittier was selected to fly one of the first of the new SBDs to the fleet from the Douglas plant in El Segundo. Whittier's flight log describes this trip and also records that he checked out and familiarized himself in SBD-1 BuNo 1748 on 29 November 1940.

> As an introduction to our new airplane, 3 pilots of Bombing Squadron 2 (VB-2) of the *USS Lexington* (CV-2) Air Group were given an indoctrination by the Douglas Aircraft Factory, El Segundo 'reps.' It was just a tour of the Dauntless assembly line, a briefing from the pages of the SBD Pilots' Handbook, a cockpit check-out and accommodations at the plush oceanside Santa Monica Club. My aviator's Flight Log Book shows a 0.1 hour hop with test pilot Frank Holt, a former aviation cadet from the early 80s flight classes, followed by a 0.3 hour solo ride to complete the check-out. Then on December 20, 1940, I delivered the first SBD-2, BuNo 2105, to the Fleet... (Whittier 1994, 1).

1940 to 1942: USS *Lexington*=s Bombing Squadron TWO (VB-2)

As of 7 December 1941 the U.S. had seven carriers in its inventory. These were *Lexington* (CV-2) and *Saratoga* (CV-3), *Ranger* (CV-4), *Yorktown* (CV-5), *Enterprise* (CV-6),

Wasp (CV-7), and *Hornet* (CV-8). Between 8 May and 26 October 1942, four of those seven carriers would be lost in combat: *Lexington* at Coral Sea, *Yorktown* at Midway, *Wasp* off Guadalcanal, and finally *Hornet*, which by that time had been in commission for a little over a year. *Hornet* finally succumbed after a sustained pounding that included bombs, torpedoes, a crashing Japanese plane, and shellfire from friend and foe at Santa Cruz. *Ranger* was stationed in the Atlantic Theater. The remaining two carriers in the Pacific Fleet, *Saratoga* and *Enterprise*, had both been damaged. By 31 August *Saratoga* had been torpedoed twice and was undergoing repair. *Enterprise* alone remained in service, carrying a heavy burden despite the repeated pounding it had received at Santa Cruz. The crucial role these vessels performed in the early days of the war can never be overemphasized.

As one of the first aircraft carriers, *Lexington* possesses a substantial historical significance of its own. This increases the significance of the history of BuNo 2106. Further information on the *Lexington* class carriers and their construction can be found in Rock (1928), Silverstone (1977), Stern (1993), and Ewing (1993). Both Hoehling (1971) and Ewing (1993) have provided a recent historical treatment of the *Lexington*. Johnston (1942) and Whittier (1992) provide first-hand accounts of some of the aspects of life aboard *Lexington* before and up to the time of its loss.

Introduction and Early Fleet Operations

BuNo 2106 operated as part of *Lexington*'s Air Group from 31 December 1940 until late April 1942. Whittier has recorded his impressions of the SBD-2's performance in VB-2 during

his time on *Lexington*:

> Bombing Two accepted delivery of SBD BuNo 2106 before the end of the year, and it immediately took a place in the Squadron Organization as Two-Baker-Two carrying the white lettering 2-B-2 on the side of the fuselage. Although my seniority in the squadron could have had me leading a three-plane section in our eighteen plane flight organization, I felt honored to be up next to the commanding officer in his 2-B-1 and positioned for me to lead if necessary.
>
> The Dauntless was a pleasure to fly, powerful and heavy, yet responsive and forgiving. It took me through hours of tactics, long navigation flights, gunnery, strafing and dive bombing. After flying the SB2U which was impossible to dive, SBD 2106 was easy to control, vertically as in straight and level flight. The dive brakes at the trailing edge of the wings came as an innovation permitting high-angle dives with such ease of control and acceptable speed that bulls-eye bombing was the ordinary not the exception for any pilot. Organizationally paired off, man and machine, I flew 2106 (2B2) on most every flight, knew its quirks and gave it tender care for 150 hours of my final days in VB-2. With the onset of the War the length of our flights jumped from about 1.5 hours to 4.5 to 5 hours with several 6 hour rides. These were wearying, long range, gas guzzling enemy searches from the carrier, flown at low altitude, 200 feet ('see but not be seen') with little air underneath in which to arrange for a forced water landing. But the reliability that I built up in 2106 made this pilot confident to the point of complacency (Whittier 1994, 1-2).

Whittier further describes his memories of BuNo 2106 during this time:

> SBD BuNo 2106 helped fill the VB-2 stable sometime between December 21, 1940 and January 13, 1941, the date of my first fingerprints on her stick as we did FCLP [field carrier landing practice] together. From that date until well into World War II, March 1942, I flew 2106 much of the time with my log recording 149 hours of bombing, gunnery, and tactics- and after Pearl Harbor with ASW Patrols, long range searches (single and two plane 5-6 hour missions) and, still, bombing practice...she flew smoothly, trimmed out perfectly to hold course and altitude on autopilot at 200! That is why I flew 2106 so often and particularly on the prize ride of my career (Letter, CAPT Mark T. Whittier USN (Ret) to CAPT R. L. Rasmussen USN (Ret), 10 January 1994).

The Lake Charles War Games

In early August of 1941 an order came for VB-2 to prepare to fly *en masse* to Lake Charles, Louisiana, where it and three other Navy squadrons would participate in the U.S. Army's General Headquarter (GHQ) maneuvers (Whittier 1992, 28). On 9-10 September 1941 VB-2 flew to Lake Charles. Whittier's description of the conditions that existed there reveal the differences between how land-based and carrier-based aircraft were treated.

> The field was so bad (ankle-deep mud for parking area and only a crushed rock surface runway) that the pilots called back to San Diego to report the alarming situation. Our SBDs, being carrier-configured, had small solid rubber-tired tail wheels [vs. larger, air-filled ones] which would swivel easily on wooden decks but would mire down in the mud... (Whittier 1992, 29).

The CO of Bombing TWO at that time, LCDR Harry Don Felt (later ADM Felt, CinCPac during the Vietnam War), sent Whittier to the Douglas Aircraft factory in El Segundo to obtain some of the pneumatic tail wheels being used on land-configured Banshees. Whittier met the factory representative, who:

> ...took me out into the factory to a block-long assembly line where all these planes were lined up, tail high in varying stages of completion. The further down the line the more skeletal the planes became until we arrived at one barely recognizable as an aircraft much less an SBD...and a tail wheel lay yet to be assembled on a work bench nearby. 'This is what you need', he said signing the workers inventory-of-materials list, '--take it and we'll truck the seventeen down tomorrow' (Whittier 1992, 29).

Whittier goes on to describe the field conditions which confronted VB-2:

> Louisiana weather is mixed in August and we took care of the mud with our temporary tail wheels but could do nothing about the mud when it dried to dust. Our engines were not equipped to handle such clouds of solids, and began to show signs of wear with metal particles in the oil--the abrasive effect of the dirt on moving parts. Finally with tired men and weary machines, we flew back to San Diego ever so glad to have the war games over (Whittier 1992, 31).

According to his flight log, Whittier flew back to California over the period of 1-3 October 1941.

> Once in our home hangars close inspection of our engines revealed massive damage caused by the dust, the warning having been excessive oil consumption. My solo departure from Lake Charles was with the worst 'oil-burner' [in this case BuNo 2154, although his aviator's flight log indicates that he often flew 2106 in the Lake Charles war games] in the squadron but the best squadron mechanic in the rear seat, the flight taking instead of one stop for fuel, it took five--for oil! Since we were redeploying to Pearl Harbor in a week or so the decision was to replace all eighteen planes with new engines. It mattered little then but with the experience of ensuing cost conscious years, I shudder to think of the dollar sign that was affixed to the bottom of our Louisiana War Games report (Whittier 1992, 31).

As part of the eleventh hour reinforcement of outlying Pacific bases, *Lexington* embarked the SB2Us and marine aviators of Marine Scout Bombing Squadron TWO THIRTY-ONE (VMSB-231, soon to be redesignated VMSB-241) and sailed on 5 December 1941 to reinforce Midway Island (Cressman 1994, 24). BuNo 2106 and some other aircraft of the *Lexington* Air Group were temporarily left behind at Pearl Harbor during this ferry mission. BuNo 2106 remained in VB-2's hangar on Ford Island from 5 to 12 December 1941. Whittier relates:

> The first days of December, 1941 had us shore-based at Ford Island furiously making ready to return to sea as had been our practice over the previous visits of the ship. We had flown ashore and the ship came in to Pearl Harbor on December 1, a Monday, for what was hoped to be a time well spent repairing planes, replenishing aviation spares and materials, not to mention enjoying a tropical weekend of rest and relaxation.
>
> Suddenly on Wednesday the 3rd the ship received orders to take on board a full squadron of Marine SB2U aircraft and crews and transport them to the vicinity of Midway where they were to be an advanced base. This meant 'buttoning up' our activities ashore while the ship hoisted the Marines on Thursday for a Friday, December 5th sortie of the *Lexington*. The Marines' SB2Us were squeezed into the hangar deck leaving a full 900 feet of flight deck clear for our air group (Whittier 1992, 32).

Lack of space aboard *Lexington* and BuNo 2106's engine trouble must have contributed to the decision to leave it behind.

The Japanese Attack on Pearl Harbor

On 7 December 1941 a Japanese carrier task force, in Operation HAWAII, surprised the U.S. Pacific Fleet at Pearl Harbor, Territory Hawaii. During the attack, 18 U.S. Navy warships suffered varying degrees of damage from bombs or torpedoes, including all of the battleships present: *Arizona*, *Oklahoma*, *California*, *Utah*, and *West Virginia*, were sunk; and *Maryland*,

Tennessee, and *Pennsylvania* were heavily damaged; *Nevada*, the only battleship to get underway had been damaged during the sortie. Approximately 2,400 American marines and airmen were killed and 1,300 more injured. Furthermore, 230 aircraft were destroyed (Potter 1987, 289). The events leading up to the Pearl Harbor disaster are discussed extensively by Prange (1981, 1988, 1990).

Japan's surprise attack on Pearl Harbor soon led to Congressional declaration of war on the Japanese Empire on 8 December. Germany and Italy, Japan's Axis partners, declared war on the U.S. on 11 December. The United States, which had been engaged in an undeclared war with Germany in the Atlantic since the spring of 1941, in turn, quickly reciprocated.

The intended primary targets of the Imperial Japanese Navy were the aircraft carriers based at Pearl Harbor. In the absence of the carriers, battleships and aircraft became the targets. *Lexington* was delivering SB2Us to Midway, and *Enterprise* was supplying F4F-3s to Wake. As a result of this raid, the U.S. Navy, was forced to center the fleet on its carriers. The aircraft carrier would subsequently prove itself the dominant naval weapon of combat and strategy. Although the battleship remained a powerful weapon, it never regained its former level of importance in the order of battle. Naval carrier aviation proved instrumental in reversing the balance of power in the Pacific (Potter 1987, 289).

Whittier recalls what occurred when *Lexington* received word of the Pearl Harbor attack, and describes *Lexington*=s return to Pearl on 13 December:

> In hours the mission to deliver the Marines and then the SB2Us to Midway was 'scrubbed' and *Lexington* headed back to Pearl Harbor which, we were told, needed our air defense capabilities, a major part of the little that was left in the Pacific Ocean. December 13 found us returning to the tropical isle, the climate being the same but the atmosphere had become one of alert and tense frenzy. Battleships at piers around Ford Island were on their side or bottom up with tugs and work barges alongside in a frantic rescue role. At the approach to the exit to Pearl Harbor rested the *USS Nevada*

> with her prow on land where she had driven herself rather than be sunk in the channel. She was the only battleship to get underway during the raid and was able to withstand her licks better than the others (Whittier 1992, 34-35).

Upon flying their squadron from the *Lexington* to their Ford Island hangars, the crews were shocked at what they saw. Whittier's memories are vivid:

> The hangars and apron we called home had been untouched as the strike targets were ships and aircraft primarily. The real impact of the catastrophe at Pearl Harbor hit home with a feeling of gloom and doom. Once parked I left my plane for the hangar. The air was filled with the clamor of work on the nearby hulks of the battleships and the stench of the ashes, burned paint and metal permeated the hot atmosphere. Men were still entrapped in those inverted behemoths [here he must be describing the capsized battleships *Oklahoma* (BB-37) and possibly the *Utah* (AG-16, ex BB-31)] looking even larger with a bottom view, and the tapping of those trapped in the hull hastened the efforts to get them out...
>
> On taking off [not much later, on an anti-submarine patrol] more of the devastation could be seen. The Navy patrol plane ramp area was a sequence of hulks or black marks on the concrete from which charred plane wreckage had already been cleared. Hickam Field just beyond the PH Navy Yard was even a worse scene of ravage as all Army planes had been wiped out. The casualty reports we had received aboard ship took on a new degree of credibility and the feeling of gloom was overtaken by anger, hatred, and determination to even the score, somehow.
>
> [After landing upon his return from anti-submarine patrol]...The night's total blackness was punctuated every now and then with the eerie flash of the torches from the battleship scenes as I made my way to the other side of Ford Island from our hangars where married officer's quarters were located on 'Battle Ship Row' (Whittier 1992, 35).

Although BuNo 2106 survived 7 December, at least two in its squadron, VB-2's BuNo 2112 and VS-2's BuNo 2146, did not. Both of these aircraft were destroyed while parked at Ford Island. One possible reason BuNo 2106 survived while the other two did not, may be 2106 was under cover in the air group=s hangar, whereas the other craft may possibly have been exposed.

The Early Pacific Raids and Other Operations

Not long afterward, BuNo 2106 was reunited with *Lexington* when it returned to Pearl Harbor. Following this brief in-period, *Lexington* departed Pearl to carry out a diversionary raid

on the Japanese mandated islands in support of the attempt to relieve Wake Island in late December (Cressman 1994, 24). Two alterations were made to VB-2's aircraft at this time; aluminum seats were replaced by armored ones, and the thinner windshields were replaced with heavier, bulletproof windscreens. Because of the increased weight, these alterations were not made until the ship put out to sea, and at that point they were only undertaken on a plane-by-plane basis (Letter, CAPT Mark T. Whittier USN (Ret) to CAPT R. L. Rasmussen USN (Ret), 3 June 1994). The seat change, and some of the design problems experienced during field adjustments, are evident in a passage from Whittier (1992):

> Much as a new car now comes complete with seats, bucket or bench, vinyl or cloth, automatic or manual, our SBDs came with pilots seats: aluminum or 5/8" steel bullet proof in case of war. Immediate steps were taken to make the switch for the pilot would need the protection the armored seat provided as it covered much of his body--high in the back with sides that shielded shoulders, arms, hips and thighs. These seats were new and different and it took a bit of getting used to. I was forever hitting my funny bone on the protruding sides and the bungee rubber suspension cords weren't strong enough to raise the seat to top position for landings so that one had to stand up lifting against the lap-belt and shoulder straps to raise the bloody thing. A marvelous protective feature but poorly designed and flight tested; on my first carrier landing the impact of the contact with the deck (never a smooth gentle thing of beauty) the bungees and retaining latches that held the seat in the 'up' position failed the pilot and armor collapsing to the full down position and with such a violent thud that I hit my chin on my up-bent knees. From that full down position I could see stars but hardly out, making it difficult to taxi and park the plane. Back to the drawing board we might as well have said then but our inventive mechanic crews made a quick fix that never failed and we never missed a day.
>
> The seat caused another unforeseen problem. It was a large mass of iron to put in front of and close to our compass. The magnetic attraction affected the readings severely enough so that several of the pilots had navigation problems on their first flights. None was lost and we learned to calibrate the compass on sunrise and sunset flights by heading right into the sun on the horizon and correct the reading to east or west as the case may be. No matter how much the factory tested our early planes there were always discrepancies that the fleet pilots would find (Whittier 1992, 36-37).

Now in the South Pacific, Whittier further describes how he narrowly averted a crashing Japanese bomber while sitting on the fantail of *Lexington*, in his aircraft, and recounts the scene of what later came to be known to some as AButch O=Hare Day,≅ marking the Navy=s first active-duty aerial ace of the Second World War (Whittier 1992, 43-44). Following this, Whittier

participated in the 10 March 1942 carrier raid on Japanese shipping off Lae and Salamaua, New Guinea. Whittier's following recollections of this significant naval action are revealing:

> All of early 1942 with SBDs doing most of the flying, the *Lex* was searching for the enemy fleet in Western Pacific waters--to no avail. At last through intelligence channels, it was learned the Japanese had occupied New Guinea in early March landing troops in as much as division strength at Lae and Salamaua on the Huon Gulf to secure the large airfield and prepare New Guinea to be the jumping off place for the invasion of Australia. On March 10, 1942, an air attack was launched by the *Lexington* and the *USS Yorktown* (CV 5) at that position, well up into the Gulf of Papua. The flight across New Guinea and the 16,000 foot Owen Stanley Mountains to our targets (heavy and light cruisers, destroyers, cargo and transport ships) was at the most 150 miles and 2B2 sang like a mechanical bird as she lifted the 1000# bomb up to 19,000 feet over the mountains which, at halfway, seemed to just slide away in a sloping blanket of green to the distant, quiet harbor, shortly to become the 'object of our affections.' The SBD cockpit from the outset was found to be a place of comfort with everything at an easy glance to see and a comfortable reach to operate. (There was even a small ashtray - heaven forbid!) A new sense of security accompanied the wartime installation of the heavy armor seat and the thick bulletproof windshield glass giving me the feeling that I was safe as I'd ever be this far away from my old hometown.
>
> The accompanying TBD-2s [*sic*, Whittier probably means TBD-1s here], torpedo planes, of VT-2 with great effort scraped over the 16,000 foot tops of the mountains and immediately began their long glide to sea level and the Harbor of Huon Gulf. The ships became visible as mere specks in the water 30-40 miles distant. I was flying #2 on the Skipper [LCDR Weldon Hamilton, CO of VB-2] with Clem Connally #3 and excitement was taking control as the realization came over me that 2-B-2 and I were going to make that first dive. It had to be perfect. My throat and mouth were very dry probably from oxygen, certainly not fear, as it was too late for that. The silence in my helmet earphones was broken by my gunner [Aviation Radioman Second Class Forest G. Stanley] saying, 'Mr. Whittier, would you like some peanuts?' I couldn't have swallowed them at best, but it did boost my morale to hear how confident my 'passenger' was in the 'ride' we were taking. He was as relaxed as I was in #2106.
>
> All of a sudden as we neared the target, I couldn't find my leader in front of me. The Skipper--he had just disappeared. I could imagine many things, but there was no time for that. The other 16 planes of Bombing Two were right behind me in a formation of which I had suddenly become the leader. Doctrine went to work as I signaled Clem to close in on my wing. I then arm pumped to visually order all planes into a long echelon, and I began a gentle turn toward the Gulf with a gradual loss of altitude. All of a sudden up popped the Skipper out of nowhere and he again took his position ahead of me in the glide. (I later learned his engine quit as he let a tank run dry - an oversight not uncommon with grogginess coming from low oxygen)... (Whittier 1994, 2-4).

In *Queen of the Flattops* Johnston records his interview with LCDR Hamilton, who recounts his leading VB-2's dive on the Japanese vessel:

> I selected a fine cruiser...It looked from 8,000 feet like a giant speedboat racing for the open sea. It was really pretty; alive. But I was too enthusiastic. I hadn't allowed for the wind at lower levels. It drifted me in my dive over the target and my bomb hit the water alongside. But the man right behind me [Whittier] saw my error and corrected for it. His heavy bomb plunged through the cruiser's after

deck and the tremendous blast smashed the stern portion to a tangle of debris. This fellow sank within a few minutes (Johnston 1943, 112).

Whittier's commentary complements Hamilton's:

For more than four years I had been practicing for this one dive, so it had to be perfect. Gliding down in a very gradual turn the airspeed indicator began to wind up 240-260-280 knots as my target began to slide under the nose cowl of my plane. To compensate, my mental checklist began. "Nose over a little more, set props, reduce throttle slightly, adjust gas mixture for lower altitude, carburetor heat, electric bomb releases 'on' and safety 'off,' adjust seat for best comfort with eye up to the bombing telescope, check rear seat man- ready, altimeter now at 12,000 feet - 2,000 feet to go to pushover for the vertical part of the dive. There it was, 10,000', dive breaks open, goggles down, hood open, push it straight down and even so the airspeed braked back by 120 knots to 250; target now clearly in my telescope sight - making a tight circle and leaving a white wake; 2B2 felt perfect in the dive, trimmed for almost hands off flight as though flying at a level cruise but instead straight up and down; eye to the scope, cross-hairs on the ship (cruiser or large destroyer), estimate ship's speed, allow for the turn, catch a glimpse of the altimeter; see any AA? The stinging bite of high altitude, cold air now became hot and tropically humid; I'd better release - punch 'the pickle' on the stick, 1000 pounds drop off, and I heave back, tighten gut muscles, yell to keep blood in the head, no blackout on this ride; close the dive flaps - close - close! They wouldn't! Windshield, goggles, and hood all steamed over from the rapid temperature change. Close those flaps! No, something is wrong! Instead of enjoying a nice 200-250 knots for a hasty retreat I was having to apply more and more power just to maintain 100 knots! Altitude 500 feet and just able to hold it. What's wrong? AA? Run out of Fuel? Cannibals? Water landing? All flashed through my mind. Then I began to simmer down. 'Don't let this plane fly you, Whittier,' I'd said many times, "Now what could be wrong? The dive brakes open hydraulically, so do the wheels and engine flaps; maybe system pressure from the prolonged dive airlocked the plumbing; try lowering the gear. Here I am over enemy territory with wheels down, dive flaps open at 100 knots! Wheels up again. Try the flaps once more." AND THEY CLOSED! The speed shot up, and I began to climb. Again, Lucky Whittier!

With the urgency of my pullout predicament, I'd no time to turn and look back to see where my thousand pound bomb had gone. The dive felt good all the way down, and I didn't see how we could miss. Planes were all over the sky but way ahead of me, and I didn't try to race for a rendezvous with my own. Instead I picked out two TBDs lumbering along starting their trip back over 'the hill,' and I joined them as they might need my help.

The return and landing on the carrier were uneventful, and the scene in the ready room was anything but ordinary. Elation was at an all time high as damage assessments added up from the crew debriefings. The pilots who had followed me in the dive said my bomb hit in the afterpart of the ship, that the explosion raised the stern out of the water, propellers in the air, only to settle back on her side in the immediate throes of sinking. Our score that day was: 12 ships sunk, one plane shot down.

So it was. Our first offensive strike against the Japanese- only the beginning of an atonement that could be claimed, over the next three and one-half years, by many SBD victories.

Cdr. Duckworth, the air officer of the ship and later to become a three-star admiral, collared me in the wardroom a few days later to say that '...We are recommending you for the Navy Cross, Whittier.' My reply was to the effect that I couldn't see why. It was nothing more than I had been trained to do for three years, and it came natural for 2B2, #2106 (Whittier 1994, 4-6).

Whittier=s Navy Cross citation reads Aon March 10, 1942, in enemy waters, he pressed

home a vigorous and determined dive bombing attack, in the face of heavy anti-aircraft fire, on enemy ships, sinking three of them≅ (Letter, Secretary of the Navy to LT(jg) Mark T. Whittier USNR, undated). Although there seems to be some debate over exactly which ships were sunk in this raid, and what types they were (Cressman 1994, 25), the citation ignores the equally important issue of Whittier=s timely demonstration of responsible and mature leadership on the squadron level at an extremely crucial moment. Perhaps more significant than individual tallies is the fact that when the squadron leader fell out of the team equation at a most inopportune moment, it was Whittier as the number two aircraft in the formation who temporarily assumed the lead, and quickly formed the squadron up for their attack.

The damage inflicted in this raid to the ships of Lae and Salamua severely hampered the Japanese amphibious operation in the Southwest Pacific and ultimately led to the Battle of the Coral Sea when the enemy moved carriers into that theatre to support further landings. President Roosevelt called the raid "the best day's work we've had" in the conflict.

After returning to port for three weeks of upkeep in preparation for its Coral Sea cruise, *Lexington* left Pearl on 16 April (Morison 1949, 14). Sometime during this period, Whittier and BuNo 2106 were both detached from VB-2 and sent their separate ways. *Lexington* sailed for the Coral Sea and never returned.

BuNo 2106's Aircraft History Card indicates that at this point it was shipped to the Pearl Harbor Aircraft Battle Force (AirBatFor) pool, where it was received on 15 April 1942. The card also indicates that its installed radial engine was WAC serial number 5123. On 6 May BuNo 2106 was shipped and received by the recently-formed Carrier Aircraft Service Unit ONE (CASU-1). On that same day, it was subsequently shipped to and received by *Saratoga*=s Bombing THREE, where it

apparently stayed until 15 May, when it reverted back to the APearl Harbor, Pac.≅ aircraft pool. Its time with VB-3 corresponds with a time of transition for that squadron, as their ship was at Puget Sound Navy Yard having been torpedoed in January 1942, and the squadron was soon to be temporarily assigned to *Yorktown*=s Air Group along with VF-3 and VT-3 in preparation for what would be *Yorktown*=s battle.

1942: Marine Scout Bombing Squadron TWO FORTY ONE (VMSB-241) at Midway

The Events Leading Up to the Battle of Midway

The Battle of Midway is widely regarded by historians as one of the more important naval engagements fought in the course of world history. To fully appreciate its significance, it is important to understand the severe losses the Allies had suffered in the Pacific up to the eve of this decisive engagement.

On 8 December (7 December east of the Date Line), Japanese forces invaded Malaya and Thailand. Japanese planes bombed Hong Kong, Singapore, and the Philippine Islands, inflicting extensive damage on USAAF aircraft at Clark Field, Luzon. Japanese bombers pounded airfield installations on Wake, causing heavy damage to facilities and diminishing VMF-211's complement of Wildcat fighters, and inaugurating what would be almost daily air raids to soften the atoll for invasion. That same day, Japanese aircraft bombed U.S. installations and shipping at Guam.

Disasters west of the Date line mounted on 10 December: Japanese Navy land-based medium bombers nearly blasted the Cavite Navy Yard off the face of the earth, eliminating that facility as a base for the Asiatic Fleet. That same day, Japanese troops began landing on Luzon. Land-based Japanese planes sank British battleship HMS *Prince of Wales* and battle cruiser HMS *Repulse* as they attempted to seek out and destroy Japanese amphibious shipping off Malaya. Guam, virtually undefended, fell after gallant but futile resistance.

Some good news came on 11 December, when the Wake Island garrison soundly repulsed a Japanese invasion force with shore battery gunfire and Wildcat fighters; later the same day, a Wildcat bombed, and most likely damaged, submarine *RO 66* south of the atoll. That same day (10 December east of the Date Line) an SBD from carrier *Enterprise* (CV 6) sank submarine *I 70* northeast of Oahu.

Relieving Wake Island assumed critical importance, and all three of the Navy's carriers were deployed in the relief efforts. The Japanese' deploying carriers, however, to aid in their attempts to prepare Wake for invasion, added a dangerous variable in the calculations to relieve the beleaguered advanced base, which ultimately fell on 23 December in a pre-dawn assault. Hong Kong fell to the Japanese on Christmas Day. Japanese operations in the Philippines continued.

Events that began to transpire in 1942 gave the Allies little cause to rejoice in a new year: on 11 January, Japanese submarine *I 6* put *Saratoga* out of action southwest of Oahu, resulting in a voyage to Puget Sound for permanent repairs and modernization, while the same day the enemy launched their campaign against the Netherlands East Indies. By mid-February, the Japanese juggernaut had taken the British possession of Singapore and imperiled the Dutch East

Indies. By the end of February, Japanese naval forces had trounced the American-British-Dutch-Australian (ABDA) naval forces in the Battle of the Java Sea, and then began ruthlessly hunting down and sinking many Allied vessels attempting to flee to Australian waters as they launched final operations to secure Java. Australia itself lay within range of Japanese planes; a carrier air strike on 19 February had virtually eliminated Darwin as an ABDA naval base in a devastating strike that some have dubbed "Australia's Pearl Harbor."

The Japanese had now attained their desired ASouthern Resources Area≅ and established a defensive perimeter that extended from Burma through the East Indies, Rabaul, the Gilberts, the Marshalls, and Wake Island. Next, they intended to seize the Solomons, the New Hebrides to New Caledonia, Fiji, and Samoa, to gain control of the Coral Sea and to sever the Pacific lifeline to Australia. The first step in this strategy was to take Tulagi, in the Solomons, and Port Moresby in southern New Guinea. The next step was to take Midway, Athe sentry for Hawaii,≅ in early June. Then, Australia, New Zealand, and GEN Douglas MacArthur's land forces could be reduced and destroyed at comparative leisure while at the same time making Hawaii untenable for what remained of the U.S. Pacific fleet.

In early April the Allied situation continued to worsen. Japanese carriers went on a rampage in the Indian Ocean; the British Eastern Fleet lost the carrier HMS *Hermes*, as well as heavy cruisers HMS *Dorsetshire* and HMS *Cornwall*, the destroyer HMAS *Vampire*, and the corvette HMS *Hollyhock*. On 9 April Bataan fell, and less than a month later, on 6 May, LTGEN Jonathan Wainwright ordered U.S. and Filipino forces at Corregidor to lay down their arms in the largest surrender of American military forces U.S. history (Morison 1963, 86). With the fall of the Philippines, Allied fortunes in the Far East reached their nadir.

Most of the success achieved by the Allies in the Pacific, however, lay in the virtually Unhindered operations of the U.S. Navy's carrier task forces. VADM William F. Halsey's force, centering on *Enterprise* and *Yorktown* hit the Marshalls and Gilberts on 1 February; the *Enterprise* conducted a solo air group raid on Wake on 24 February; pounded Japanese invasion shipping at Lae and Salamaua, New Guinea on 10 March. Two particular raids impacted Japanese strategy in the central and northern Pacific due to their proximity to Japan: *Enterprise'*s 2 March raid on Marcus Island, and the bold 18 April Halsey-Doolittle Raid launched from *Hornet* and covered by *Enterprise* on Tokyo and other major Japanese cities. The Doolittle Raid while causing little damage and concern among the Japanese populace-at-large, worried the military, which had not prevented such an immediate threat to the Emperor. At that point, the Japanese thus intended to close a small gap in the defense perimeter by seizing Midway and the Aleutian Islands of Attu and Kiska, and to draw out and destroy the U.S. Pacific Fleet's carriers in the process.

Meanwhile, during the period from 4 to 8 May, a series of actions later known as the Battle of the Coral Sea occurred. This battle reflected the American determination to halt the Tulagi-Port Moresby operations, information about which had come primarily from the U.S. Navy's decryption of Japanese naval message traffic. Because VADM Halsey's task force was dedicated to carrying out a Tokyo Raid, ADM Nimitz was only able to deploy the *Lexington,* commanded by RADM Aubrey W. Fitch and *Yorktown*, commanded by RADM Frank Jack Fletcher, task forces that were joined by a task force of cruisers and destroyers under the command of RADM John G. Crace, RN. After both sides committed a number of tactical errors, the battle concluded on 8 May with fierce air attacks that ensued when the Japanese and

American carrier forces located each other, and launched their air groups almost simultaneously. In sum, the Japanese lost the small carrier *Shoho* off Misima Island on 7 May and destroyer *Kikuzuki* off Tulagi on 4 May; while the carrier *Shokaku* was severely damaged, and *Zuikaku* suffered heavy losses in its air group on 8 May. The U.S. Navy lost carrier *Lexinton* on 8 May, destroyer *Sims* (DD-409), and oiler *Neosho* (AO-230) on the 7th. *Yorktown* received substantial bomb damage on 8 May but returned to Pearl under its own power. Although the Japanese gained a slight tactical victory in terms of ships destroyed, in strategic terms the Americans were the victors, turning back the enemy's thrust at Port Moresby. Furthermore, this battle effectively eliminated two Japanese fleet carriers from participation in this pending Midway operations. Notably, the Battle of the Coral Sea proved to be the first naval engagement in history fought between carrier forces, and one in which the opposing surface fleets never came within sight of each other (Potter 1988, 294).

From 4 to 6 June the Battle of Midway occurred. At that time, the Japanese Navy could deploy 11 battleships, eight carriers,, 23 cruisers, 65 destroyers, and numerous oilers, transports, and auxiliaries. The U.S. Navy had available in the Pacific only three carriers, eight cruisers, 14 destroyers, some oliers and auxiliaries (Potter 1988, 296). These U.S. assets were formed into Task Force 16 under the command of RADM Franck Jack Fletcher, centering on the hurriedly repaired *Yorktown* whose air group now included displaced squadrons from the torpedoed *Saratoga*.

The Battle of Midway does not need to be completely described anew here. Details of the actions, tactics, strategies, errors, operational intelligence, personalities, and other specialized aspects of the event have been compositely dealt with in sufficient detail in Dickinson (1942),

Moore (1943), Heinl (1947), U.S. Navy Office of Naval Intelligence (1947), Morison (1949), Fuchida and Okumiya (1955), McCluskey (1964), Smith (1966), Lord (1967), Frank and Harrington (1968), Smith (1969), Lundstrom (1976a, 1976b), Gay (1980), Sherrod (1980), Prange (1982), Potter (1987), Keegan (1988), Buell (1991), Miller (1991), Cressman et al (1992), and Greene (1994). The engagement can, however, be summarized.

The Japanese task force was sighted by Midway-based patrol planes on 3 June. On 4 June Japanese carrier planes attacked Midway in preparation for invasion, and, at approximately the same time, the American Midway-based aircraft attacked the Japanese fleet. USMC fighter Buffaloes and Wildcats which scrambled to meet the incoming Japanese suffered grievous losses, as did the Midway-based bombers and torpedo planes, the Dauntlesses, Vindicators, Marauders, and Avengers that attacked the Japanese carrier force, due primarily to a combination of obsolete aircraft, pilot inexperience, and lack of fighter protection. Although the initial American attacks on the Japanese carriers were unsuccessful, they came as the Japanese learned that their initial strike had failed to damage Midway Island's runways sufficiently. Because of this failure, VADM Chuichi Nagumo decided to change armament on all of his aircraft to bombs, intending a second attack on Midway Island, instead of the already-prepared ordnance intended for attacking the American forces at sea. This change was a time-consuming process for the armorers.

While VADM Nagumo was landing and rearming the Midway strike-force for this intended second attack, the air groups of *Enterprise*, *Hornet* and *Yorktown*, were heading toward the Japanese vessels. Torpedo Squadrons EIGHT (VT-8), SIX (VT-6), and THREE (VT-3) arrived, one upon the heels of another and bravely pressed home near suicidal attacks. None of

the Devastators managed a hit and almost all were obliterated by defending Mitsubishi "Zeroes" and shipboard anti-aircraft fire, in the horrific slaughter that ensued.

These desperate actions, culminating in the attack of VT-3 and VF-3 Wildcats proved instrumental in drawing downward, and keeping engaged at a low altitude, the Japanese Combat Air Patrol (CAP). It was at this most vulnerable moment that three squadrons of carrier-based Dauntlesses simultaneously arrived above the enemy carriers and their engaged CAPs, and began their attacks. In the space of a few minutes, *Akagi, Kaga* and *Soryu* lay mortally damaged and burning fiercely with *Enterprise* SBDs responsible for the first two and *Yorktown's* for the latter carrier. The remaining carrier, *Hiryu*, escaped this carnage, and launched two strikes that attacked *Yorktown* and caused that ship to be temporarily abandoned. Later that day, however, a strike group of SBDs from *Enterprise*, including some of *Yorktown's* orphaned Dauntlesses, left the *Hiryu* burning and adrift; it sank the next morning, on 5 June. On 6 June, Spruance's SBDs found and bombed the damaged heavy cruisers *Mogami* and *Mikuma*, sinking *Mikuma* and severely damaging *Mogami* to the point where it was put out of action for a year. On the same day though, the Japanese submarine *I-168* penetrated *Yorktown's* screen during the salvage operations, and torpedoed *Yorktown* and *Hammann* (DD-412) as it lay alongside *Yorktown* supporting the salvage party. *Hammann* sank immediately, *Yorktown* lingered until the next morning.

In terms of final statistics, the American forces: lost one carrier, one destroyer, 144 aircraft, and 307 lives, of which 186 were experienced aviators, and suffered extensive damage to the Midway Island installations, as well as moderate damage to the facilities at Dutch Harbor Alaska and the loss of the Aleutian islands of Attu and Kiska, lost to a simultaneous Japanese

diversionary strike. The Japanese lost four carriers, all veterans of Operation HAWAII, one heavy cruiser with another severely damaged, 256 aircraft, and a staggering 3,500 lives, including some first-line aviators (Potter 1987, 310; Cressman et al 1992, 220). More importantly, the Japanese advance in the Pacific had finally been stopped, and the counteroffensive that the Allies desired to initiate was now able to begin. A long, hard road lay ahead, but Hawaii was secure, and the momentum had swung to the Allies. Years after his 1945 signing and acceptance of the formal Japanese surrender in Tokyo Bay, ADM Nimitz summarized Midway as "… the most crucial battle of the Pacific War, the engagement that made everything else possible≅ (Prange 1982, 395).

The SBD Dauntless performed center stage in this epic battle. It eliminated approximately 50 percent of the Imperial Fleet's carrier tonnage, assisted in reversing the momentum of the Pacific War, and helped to win what has been categorized by a number of historians as one of the ten most decisive naval engagements in history (Stern 1988, 20).

VMSB-241 and BuNo 2106 at Midway

BuNo 2106's Aircraft History Card records that it was shipped to Marine Aircraft Wing TWO (MAW-2) at Pearl Harbor 23 May. The same day it was shipped to Marine Scout Bombing Squadron TWO FORTY-ONE (VMSB-241) on Midway Island, where it arrived 28 May. An exceptional detailed account of VMSB-231/241 and their defense of Midway Island is provided in Cressman et al (1992).

Recognizing a need to strengthen the U.S. military's defensive position in the Pacific, at

the end of November 1941 ADM Husband E. Kimmel, CinCPac, ordered USMC aircraft and aircrews to both Wake and Midway. Wake was to receive F4F-3s of VMF-211, while Midway was to receive a number of scout bombers detached from VMSB-231, given the separate identity of VMSB-241, as well as the Buffaloes and Wildcats of Marine Fighter Squadron TWO TWENTY ONE (VMF-221). The personnel and aircraft of VMSB-231 were to be delivered onboard *Lexington*, which sailed from Pearl on 5 December (see Whittier's earlier commentary). Upon reaching a rendezvous point off Oahu the ship took aboard VMSB-231's 18 Vought SB2U-3 Vindicators and headed for Midway (Cressman et al 1992, 17). However, upon receiving news of the Pearl Harbor raid, VMSB-231 was retained on board *Lexington*, and instead made a patrol of the Johnston-Midway-Palmyra triangle, and then returned to Pearl on 10 December although the Scout Bombing TWO THIRTY ONE had not returned. Less than a week later, it was decided to fly the SB2U-3s directly from Oahu to Midway. On 17 December 1941, the Vindicators left for Midway, flying in formation over the Pacific Ocean for nine hours and 45 minutes. The crews and their aircraft flew 1,137 miles, marking the longest overwater flight by single-engined aircraft staging from land in aviation history to that time. VMSB-241 earned a unit commendation for this effort (Commendation Letter, Commanding Officer, Marine Air Group TWENTY TWO to Personnel of Marine Scout Bombing Squadron TWO THIRTY ONE, 23 March 1942). VMSB-231 began routine patrols of the area around Midway on the following day. On 25 December the Marine air detachment was strengthened by the arrival of 14 Brewster F2A-3 Buffalo fighters of VMF-221 that flew in from *Saratoga* which had been originally destined for Wake. The following day, the seaplane tender *Tangier* (AV-8) arrived with additional ground crews, and on 28 March, *Curtiss* (AV-4) arrived carrying eight more Brewster F2A-3s for VMF-

221 and four more SB2U-3s for VMSB-231, as well as additional pilots (Cressman et al 1992, 23).

As intelligence information pointing toward an imminent Japanese strike threatened, further military strengthening of Midway Island was necessary. Consequently 19 SBD-2s were shipped there for VMSB-241. VMSB-231 had been redesignated. BuNo 2106 was one of these 19 SBD-2s, and it was shipped to Midway in the aircraft transport *Kitty Hawk* (APV-1) that arrived from Hawaii on 26 May, escorted by destroyer *Gwin* (DD-433) (Cressman et al 1994, 26). *Kitty Hawk* also brought with it seven Grumman F4F-3s for VMF-221, 21 new pilots (17 of them fresh from flight training), and 35 enlisted men for the two squadrons. The crews of VMSB-241 did not waste any time in unloading the aircraft, readying them for service, bore-sighting the guns, and familiarizing themselves with the "new" SBD-2s. In addition to the unfamiliarity of its aircrews with SBD-2s, VMSB-241 had to contend with a lack of fuel that restricted their training time (Cressman et al 1992, 35). 1stLT Daniel Iverson, Jr., USMCR(V), who would pilot BuNo 2106 on the fateful morning of 4 June, arrived on 28 March. PFC Wallace J. Reid, USMC, who would be Iverson=s assigned radioman-gunner, had joined VMSB-241 on 11 April 1942, transferring from VM53-242.

VMSB-241's CO, MAJ Lofton R. AJoe≅ Henderson, decided that due to the significant differences in the operating characteristics of his squadron's Vindicators and Dauntlesses, and probably also due to the lack of time to develop an adequate level of unit cohesiveness, he would separate the squadron into two independent divisions. One would be the SBD unit of 19 aircraft under his command, and the other would be the SB2U unit of 12 aircraft, under the command of his XO, MAJ Benjamin Norris. The majority of the experienced pilots were put in the SBD unit,

while the less experienced pilots were assigned to the SB2U group along with several of the more experienced aviators who would serve as division and section leaders (Cressman et al 1992, 43). As part of the Midway local defense force, they were ordered simply to hold the atoll (Cressman et al 1992, 39). Thus it came to pass that VMSB-241 was charged to carry out this important task with mismatched, handed-down aircraft, half of which were strange to most of them, the other half of which were dangerously obsolete, manned by a small number of pilots and radio-gunners of whom most had little or no appreciable experience.

On 4 June the Japanese Occupation Force was sighted by NAS Midway=s patrolling Catalinas, which radioed the message Amany planes heading Midway≅ (Cressman et al 1992, 57). Twenty of the old Buffaloes and four of the new Wildcats took off to intercept the incoming aircraft. Immediately following their departure, a combined strike force scrambled in quick succession to attack the vessels of the Japanese force 180 miles northwest of Midway. This hodgepodge group consisted of four torpedo carrying U.S. Army Air Force Martin B-26 Marauders, a number of U.S. Army Air Force Boeing B-17 Flying Fortresses, a small VT-8 Midway detachment comprised of six new Grumman TBF-1 Avengers, and VMSB-241's 16 Douglas SBD-2 Dauntlesses, and 11 Vought SB2U-3 Vindicators, each of which was armed with a 500-pound bomb. The SBD-2s and SB2U-3s split into separate attack units. By the time the last flyable VMSB-241 aircraft lifted off, the island was already under attack. Filming what would later constitute part of the Oscar winning documentary *The Battle of Midway*, LCDR John Ford recorded the unfolding attack on motion picture film, until he was injured by flying shrapnel. In previous days he and his assistant had filmed some of the island=s aircraft and crews, probably including those of VMSB-241 (Cressman et al 1992, 61 and 65).

Marine fighters intercepted and engaged the incoming Japanese aircraft but could not stop them from bombing the island, and during the aerial defense the Marines took very heavy losses. Of the 25 fighter planes that had engaged the enemy, only 10 returned, and only two of these were able to fly again. Fourteen VMF-221 pilots were missing and four were injured (Cressman et al 1992, 60-66). Meanwhile, the Midway-based strike force that included VMSB-241's Dauntless and Vindicator groups, pressed on in its mission to attack the Japanese fleet.

Of the 16 Dauntlesses participating in the attack, six were shot down in quick succession during a run on the carriers and were lost with their crews. Two more were so badly riddled that they could not make it back to Midway Island, ditching at sea instead. One radio-gunner who had been killed in action went down with one of these Dauntlesses. Most of the craft that did make it back suffered some degree of damage. The obsolete Vindicators also took severe punishment. Six of these were ultimately lost with their crews in the course of the battle, and two additional radio-gunners were killed by gunfire or as a result of ditching at sea (Cressman et al 1992, 75-79). Of the non-Marine Midway attack force, five of the six TBFs and two of the four B-26s were lost. These three surviving aircraft all suffered severe damage (Cressman et al 1992, 72). One PBY Catalina out of NAS Midway was also shot down about this time (Cressman et al 1992, 73-74).

Cressman describes Iverson=s role in the location of the Japanese carrier force by the SBD-2 unit, and provides an excellent summary of the action that followed:

> For the pilots and radio-gunners of VMSB-241, meanwhile, almost another hour went by after CAPT Fleming had let his rear-seat man first take the 'stick' when suddenly, [CPL Eugene T.] Card noticed 1stLT Daniel Iverson's SBD-2 closing up fast, with Iverson gesturing downward to port. Card craned his neck but did not see anything; then Fleming broke in over the interphone: 'We've made contact. There's a ship at 10 o'clock. Do you see it?' As the minutes passed, more ships--including two carriers--appeared beneath the breaks in the clouds.

Henderson and his group, flying at 9,500 feet, sighted the Mobile Force at 0755, the squadron commander informing Fleming, in the formation's command element, of two enemy flattops on the port bow. Henderson, who had been flying off to one side of the group, shepherding his young charges along, then slid back into the lead of the formation to take it in. As he did so, Card heard his pilot shout: 'Here they come!'

As Henderson and his men began to let down to attack *Hiryu*, the carrier's CAP slashed tenaciously at them. 1stLT Iverson, whose radio was out of commission and who had just joined up in the squadron commander's box from CAPT Elmer Glidden's, saw 'Zeroes' attacking Henderson's SBD-2. The major gamely kept the squadron intact until his Dauntless slanted toward the water, trailing smoke.

With Henderson having been shot down, Fleming, who had expressed a >keen desire to finish one Japanese carrier= a few days before, assumed the lead of the division, and pressed home his attack through a storm of antiaircraft fire and a swarm of Zeroes, releasing his bomb at *Hiryu* and pulling out at just 400 feet.

2dLT Albert W. Tweedy maintained his position on Henderson=s wing until the end, and Zeroes shot him down, too. CAPT Armond DeLalio, leading the third box of the first division, saw Zeroes attack the SBD-2 flown by 2dLT Thomas Gratzek, and that Dauntless, its fuselage breaking into flames behind the engine, left the formation. Two other SBD-2s of the first division went down to the guns of the nimble enemy fighters - Ward=s and Hagedorn=s - and one (Ek=s) of the second.

Gene Card, who had been wounded, tried to keep the Zeroes at bay while his pilot masterfully took the SBD-2 close to the water and kept jinking to keep the fighters off balance for the 20-mile chase...

Dan Iverson, in a dive with two Zeroes astern and firing, yanked his bomb release at 300 feet before he pulled out. Two additional fighters joined up on his two tormentors and they took turns trying to knock him down as he cleared the area and headed for the clouds at full throttle...

> The battered remnants of Henderson=s boxes cleared *Hiryu*=s vicinity, apparently having only scored one near miss. Two other bombs splashed 50 meters from the ship; one 80 and another 150. Zeroes had accounted for six planes shot down. Radio-gunners in the SBDs, however, managed to extract some retribution, downing a section leader from *Hiryu*. The Zeroes hounded the surviving SBDs for several minutes before the Marines managed to escape into the clouds with their riddled aircraft...
>
> The Marines had trouble getting back, too. 2dLT Harold G. Schlendering, his elevator controls shot away and his radio-gunner, PFC Edward O. Smith, dead, coaxed his SBD to within eight miles of the reef at Midway before his engine failed. Bailing out, he was picked up by *PT-20*. Tom Moore and his gunner, PVT Huber, wounded, could not find Midway; an inoperative radio (he could neither send nor receive) did not help. Finally, Huber called Moore=s attention to a smudge of black smoke off on the horizon - Sand Island=s burning oil tanks. Moore later wrote, gratefully, of Huber, >due to his keen observation in sighting the smoke when the pilot was lost, he is directly responsible for himself, the pilot, and the SBD returning to Midway...=
>
> CAPT Richard L. Blain tried to reach Midway too, but without success. Forced to ditch in the open sea, the two Marines broke out the rubber boat and their emergency rations. Blain and his radio-gunner, CPL Gordon McFeely (who had been a truck driver in MAG-22's headquarters and service squadron until late April), then settled down to await the rescue they hoped would soon be coming [they were rescued two days later by a patrolling PBY flying boat] (Cressman et al 1992, 74-79).

Some survivors= accounts seem to suggest that it may have been Iverson who first sighted the enemy fleet. If this is in fact the case, it may account for his leaving his assigned place in the formation, and ultimately joining the lead division. Iverson's action statement of this engagement is somewhat tersely phrased and certainly resembles Prange's description of it as Aa

masterful piece of understatement≅ (Prange 1982, 221). Iverson wrote his after-action report as follows:

> I took off with SBD-2 unit, Major Henderson leading at 0555. We rendezvoused at Point Affirm, altitude 3,500 feet. I was in box behind Major Henderson. Captain Glidden was leading the box. The squadron climbed to 9,500 feet on course of 330 magnetic. We sighted the enemy fleet at 0755 just to port of our course, distance twelve (12) to fifteen (15) miles. I left Captain Glidden's box and joined up on Major Henderson's box where I remained until attack. My radio was out of commission; I had no inter-cockpit communication.
>
> The enemy fleet was taking advantage of scattered cloud cover. Clouds were from 1,000 feet to 2,000 feet generally, but in some areas clouds were as high as 5,000 feet. We approached the fleet in gradual let down from 9,500 feet making about 150 knots indicated. As we made our approach I observed bandit aircraft ranging from 20,000 feet down. Also while we were making one and one-half circles over the fleet and from the time we began our approach, I observed fighters taking off the deck of the enemy carriers. I estimate that there were at least two (2) squadrons of enemy aircraft in the air. I observed Major Henderson being attacked by enemy fighters around our box at 5,000 feet while approaching the target, but Major Henderson kept the squadron intact until his plane seemed to go out of control about 2,000 feet. No attack signal was given. At 1,500 feet I selected a carrier target and pealed off through a thin cloud. Two enemy fighters followed me in the dive. The carrier I hit was one of three (3) that I saw. As far as I could see, I was the only plane in the SBD-2 unit to hit that particular carrier. I observed another carrier smoking amidships. The carrier had two rising suns on the flight deck, fore and aft, and appeared smaller than ours in length but slightly wider. There was no superstructure on the flight deck. My bomb according to what I observed and my rear seat man said, hit just astern the deck, a very close miss. The bomb may possibly have damaged screws and steering gear of the carrier. I saw no one shot down except Major Henderson.
>
> After observing my bomb explosion and a smoking carrier, I threaded away from the fleet on a course of 240 degrees. Two other fighters joined the fighters already attacking me, one or two of these fighters had fixed landing gear and an estimated speed of 300 knots. The fighters pursued us making overhead runs for twenty or thirty miles, when I was able to gain altitude and get into the clouds. Evasive action over water was not effective. I had release[d] my bomb at 300 feet and pulled out into level flight over water. I used full throttle and 2300 rpm. with cowl flaps open. Engine functioned perfectly. I could not estimate my speed as my airspeed indicator was shot out of commission. My plane was hit several times, by what I believe to be both fighters and anti-aircraft. My throat mike cord was severed by a bullet and my hydraulic system was shot away.
>
> On the enemy carrier I observed almost an entire ring of fire from the flight deck. The fire appeared to be coming from batteries of three inch machine guns. After flying in the clouds for ten minutes I headed home and had to land with one wheel up. My left wing was damaged in landing. I landed with very little gas left in plane. I picked up 2nd Lieut. Lumpkin on the way in an SB2U-3...I recommend that my gunner, Wallace J. Reid, Pfc., USMC, be given a citation for bravery in action. He was injured in the foot (Pilot Statement of First Lieutenant Daniel Iverson, Jr. USMCR(V) for 4-5 June 1942, 7 June 1942).

Some controversy seems to exist concerning the identity of the Japanese carrier Iverson and Reid actually attacked in their dive. While Cressman has convincingly identified the vessel as *Hiryu*, Prange's earlier analysis argued that it was *Kaga*.

> This flattop had two rising suns on the flight deck, fore and aft, appeared shorter that a comparable American carrier but slightly wider, and had no superstructure on the flight deck, not a bad description of *Kaga*. According to his and his gunner's observations, they delivered just astern of the deck >a very close miss= which Iverson hoped might have damaged the screws. *Kaga*'s action diagram shows three near misses centered closely in that very spot, the nearest one twenty meters from the port tip of the stern (Prange 1982, 220-221).

There also exists some controversy surrounding the actual number of holes that were counted in Iverson's mount following the battle. While the VMSB-241 War Diary merely records that A1stLt. Daniel Iverson, Jr. returned with a badly shot-up aircraft and made a nice one-wheel landing,≅ other VMSB-241 records note that:

> All planes that returned to base were badly shot up and some were in very unflyable condition. First Lieutenant Iverson's plane had over 210 bullet and shrapnel holes in it scattered over every portion of the plane. He was forced to make a one-wheel landing at the base (AReport of Activities of VMSB-241 during June 4 and June 5 1942≅).

In his 1944 book *Victory at Midway*, LCDR Griffith Bailey Coale, USNR recorded a particularly vivid impression he formed while observing first-hand the condition of some of the Marine Dauntlesses following their return:

> Eight return badly shot up, one having two hundred and ten holes in her. Peering through the bullet holes at the armored backs of the pilots= seats is like looking through a colander at two tombstones (Coale 1944, 117).

Iverson's squadron mate Tom Moore also described BuNo 2106 following its return to Midway Island:

> I walked over to Danny Iverson=s plane and inspected it. It was in a bad way. He had returned from the first attack with over 200 bullet holes in it and it was damaged beyond repair. He had come in with only one wheel in landing position; the other was locked by a bullet in its mechanism, but he had landed all right, remaining always on the runway and causing no damage to the B-17s parked close by (Moore 1943, 77-78; Letter, Peter Casalotti to CAPT R.L. Rasmussen USN(Ret), 3 Feb 1994).

In his *History of U. S. Naval Operations in World War Two*, Samuel Eliot Morison records that:

> 259 hits were actually counted [in the construction of BuNo 2106]; but the pilot, Lieutenant Daniel Iverson USMC, who had even the throat microphone shot off his neck, survived (Morison 1949, 110).

Robert Sherrod agrees with Morison in his statement that ALieut. Daniel Iverson returned with his throat mike shot away and with 259 holes in his plane≅ (Sherrod 1952, 60). So does Robert Heinl (Heinl 1947, 35). However, Robert Cressman disagrees, conservatively stating that Dan Iverson's SBD-2 Ahad taken 219 hits≅ (Cressman et al 1992, 79). The 259 holes recorded by Morison and Sherrod is probably the correct statistic, because that is the number indicated in the documents included with the photographs of BuNo 2106 that were taken following Iverson=s return, and which were forwarded by the CO of MAG-22 to the Commandant of the Marine Corps (CMC) on 29 June 1942 (Heinl 1947, 36 fn).

Iverson=s pilot statement records that PFC Reid was wounded in the foot during the attack by and subsequent escape from the AZeroes.≅ In the VMSB-241 Casualty List for 4 and 5 June (War Diary for VMSB-241, MAG-22, MAW-2, FMF for 1-30 June 1942), Iverson is listed as suffering from Alacerations legs and face,≅ and Reid is described as being Awounded, back and arms.≅ However, neither was removed from active duty and sent to Oahu, as many of their wounded squadron mates. Instead, both were back flying together the next day in a strike on the Japanese heavy cruisers *Mogami* and *Mikuma*.

On 5 June during VMSB-241=s raid on *Mogami* and *Mikuma*, Iverson and Reid flew one of the few remaining operable SBD-2s. Iverson recorded in his pilot statement that:

> We intercepted two enemy battleships [*sic* the types and identities of these vessels were not known at the time; they were heavy cruisers which were somewhat larger than American CAs but smaller than BBs, hence the confusion over their categorization] which were trailing oil. Oil streaks could be followed for fifty (50) miles. Six SBD-2 attacked one battleship all scoring near misses. All bombs were very close. The BBs must have had a very good method of detecting approaching planes. Their anti-aircraft shells from pom-poms and three inch had our exact altitude. We all had to take evasive action (Pilot Statement of 1stLT Daniel Iverson Jr., USMCR(V) for 4-5 June 1942, 7 June 1942).

Both of BuNo 2106's crewmen were decorated for the heroism they displayed on 4 and 5 June; Iverson with the Navy Cross and Reid with the Distinguished Flying Cross. Iverson=s citation on 7 October 1942, reads as follows:

> For extraordinary heroism in the line of his profession as a pilot in Marine Scout Bombing Squadron 241, during the operations of the U.S. Naval and Marine Forces on Midway Islands against the invading Japanese fleet on June 4, and 5, 1942. In the first attack on an enemy carrier and in the face of withering fire from enemy fighters and anti-aircraft batteries, Lieutenant Iverson pressed home his attack to a release altitude of three hundred feet. His plane received 219 hits in different places from machine gun bullets and shrapnel and was so badly damaged that he was forced to make a landing on one wheel upon his return to the base. On the night of June 4, 1942, he participated in a search and attack mission against an enemy carrier and brought his plane back to its base under extremely adverse weather conditions. On June 5, 1942, he, after less than four hours sleep, participated in an attack through heavy anti-aircraft fire on an enemy battleship [sic] in which it was damaged severely. His courage and devotion to duty were in keeping with the highest traditions of the naval service (Pilot History Card for MAJ Daniel Iverson, Jr., USMCR(V), Tray 1, Roll 86 (Hutton to Jachimowicz) on file at NHC-AVH).

One of Iverson=s fellow VMSB-241 SBD-2 pilots, 2dLT Thomas Moore, Jr., USMCR(V) published his wartime experiences in *The Sky is My Witness* (1943), a vivid and colorful contemporary account of VMSB-241's actions throughout the course of the preparations, engagement, and subsequent actions of the squadron=s surviving members. His somewhat dramatic descriptions provide insight concerning, among other things, the battle, the loss of friends, the relationships between officers and enlisted men, and the behavior of the Dauntlesses they were flying. When reading these accounts, it is not difficult to picture Danny Iverson and Wallace Reid in the same circumstances as Tom Moore and Charles Huber. Moore=s descriptions provide a unique first-hand portrayal the life and death struggle in which VMSB-

241 participated on the day of 4 June.

It was still not yet dawn when we made our way in groups of threes and fours to where the planes were waiting in pits. Private [Charles W.] Huber, my gunner, was already there checking his guns and ammunition and whatever else he could do. I didn=t know Huber very well, but in just a few hours I was to find out a great deal about him.

>Everything shipshape Huber?=

>Everything shipshape sir.=

A 500-pound bomb was in place under the fuselage. It looked deadly even there. I climbed into my cockpit and started the engine to warm it up in case a quick take-off was necessary; then I tried the radio and intercom telephones. Everything was in order. Danny Iverson, who was in the pit next to mine, waved, and I waved back. There was nothing to do now but wait...

Major Henderson=s plane started to taxi slowly across the runway that adjoined my position. As he approached, it appeared as though he were getting ready to take off on a routine patrol flight. Captain Zach Tyler ran out toward the moving plane, and when the Major saw him he stopped. Tyler bounced up on the wing and spoke a few words, then I saw Major Henderson=s hand describe a slow, beckoning motion. Tyler ran back to his own plane and started getting ready. Then Danny Iverson began to move out on the runway. That was all I needed. Already the Major=s plane was in the air.

>Okay, Huber, let=s go!=

I gunned the engine and we moved out onto the runway. We headed into the wind, and then my hand pushed the throttle forward. We began to move faster and faster. The plane was straining to lift itself into the air when the engine started coughing and spitting. I knew I wasn=t going to make it. I cut the throttle back sharply, intending to taxi the plane to the engineering shack and have the engine checked. Then I saw many more of my squadron mates taking off. I wanted to be with them. I decided to try it again. With some difficulty, we got into the air.

I had heard no formal command given, but our squadron was up. For almost a minute and a half there was nothing but the steady drone of our engine, and a few idle remarks passing over the phones. I was wondering if we would see any enemy when suddenly over the radio came the unbelievable words:

>Attention! Attention! Island is now under heavy attack! Island is now under heavy attack!...=

I glanced backward. It was true - bombs were bursting all over the island. All at once a sheet of flame streaked toward heaven and fell back. Thick palls of smoke were climbing upward from three different places. We rendezvoused at a predetermined point. We fell into a box formation as we flew. Above, the sky was very blue and clean of clouds. The wind from the propeller whipped around my goggled eyes and face, but otherwise the weather was mild. Then Dick Fleming=s voice came on directing a change in our course.

Major Henderson was some distance off to our right, flying a roving patrol scouting the enemy. He felt he was more apt to spot them if he didn=t have to concentrate on his place in the formation...

>Everything okay, Huber?=

>Okay, sir.=

I ordered him to recheck his guns and make sure they were in good working order. We=d be in this together, he and I. Rank had kept us apart; I hardly knew him. But if we died today, we=d remain beneath the sea through eternity no more than five feet apart. It was a rub...

My watch showed eighty-three minutes from time of take-off...eighty-four...eighty-five...

>Attention! Attention! All pilots, attention.= It was Major Henderson=s voice. >Two enemy carriers on our port bow! Two enemy carriers on our port bow!...Enemy carriers at ten o=clock. Attack enemy carriers.=

There they were! There were two and they were big. They left wakes that were two thin white lines upon the sea...These two big bastards - this was the enemy!

The sound of our engines, the booming within me - it was like a big bass drum beating like hell under my shirt.

>...Enemy aircraft!...Enemy aircraft! -≅

Suddenly, off to the left appeared a score of trim little airplanes, buzzing mosquito-like toward our formation. On their short stubby wings was marked an oversize red ball. Japs - Zero fighters - was all that registered as I saw them roll and twist against the sky and the sun. At first they looked almost playful; then they came down upon us. Quickly they grew from mosquitoes to sparrows, from sparrows to hawks, and, as their distance closed to no distance at all, they became warplanes firing a hundred lines of gray-white tracers that webbed in the air.

Now, above the sound of engines, I could hear the brittle rattle of machine guns. I saw them swoop down on friends flying near me. I saw my friends respond to the attack valiantly, hopelessly. They fired fast at the faster Zeros. Burst after burst of gunfire raced from friend to Zero, from Zero to friend. A Jap Zero veered and turned a hundred feet from me, pilot and motor dead. I heard the thin whine of the wind as it passed over his wings. A helmeted head lolled from side to side as the plane wobbled out of control. Then like a struck match he burst into flame and fell burning into the sea.

Still they came on. Two of them roared up behind us. Little holes were racing across our right wing. Bullets whipped into the instrument panel before me, shattering glass in all directions, shattering the radio equipment. My first and only reaction to this was, >God, here comes part of the Sixth Avenue El!= [Moore was from Brooklyn, New York.] Huber opened fire. I heard the sharp bark of our gun...It was a good sound, a comforting sound. Already one of them had turned away. The other was still behind us. Huber would get him...All at once our gun stopped firing.

>My gun is jammed!= Huber yelled through the phones.

I was in no mood for this news. >For God=s sake,= I shouted back, >if you can=t shoot the damn gun at least aim it at him! Make him think it=s good! Scare him with it!=

I am not proud of that command, but there was nothing else to do. A bullet rang off the steel armored plate behind me. To hell with that sonofabitch! The sound of gunfire was now part of me. Its impression had been made and noted. I saw a friend ride into a blast of bullets that went in one side and passed out the other. I saw that friend begin to fall. A long trail of oily black smoke was bursting from beneath his engine like a ribbon unwinding from the tumbling plane. Already many of the squadron had gone down upon the carriers. I was awaiting my turn. Though they could knock some of us to hell, they couldn=t break our formation. We would dive only when ready or only when dead.

Again and again the bastards came down, zooming under us, over us. Sometimes they passed Huber and me with only six or eight feet clearance, their machine guns giggling. Several bullets tore in and out of the fuselage -

Then I saw [2dLT Richard L.] Blain go into his dive. Now it was my turn! I kicked left - left rudder, left aileron - stick forward. We began to dive. Damn it all to hell, here we come!

Everything I had ever been taught about flying or bombing was cut so deep in me I never needed to think or remember. This was it! This was a live run! A real, live run! The bomb was armed; I checked it again and again. We were diving fast - as fast as three tons of dead weight tied to a thousand racing horses could dive. It was a sleigh-ride, a damn belly-whopping sleigh-ride.

Down, down, down, from eight thousand feet to the enemy. Below, a thick cloud bank was racing upward to meet us. In a second we were inside it, feeling its dampness, its coolness. Then, another second, we were free of it.

There was the water. And up and down inside my sights was the carrier, a rectangular piece of the enemy! We were dead upon it. No need to change direction; the cross-hairs divided it evenly. I checked my bomb again. It was growing bigger and bigger, filling the sights, filling them and now overlapping them. The wind was whining and shrieking in an unending high G.

Pull out! Pull out! A voice was shouting through to me. *Drop the bomb and pull out!*

I snapped back, glancing at the dials on the instrument panel. The needles were spinning crazily. The altimeter read five hundred feet and we were diving straight on the target!

At four hundred feet I punched the bomb release and pulled the stick toward my stomach. The bomb fell clear. I never heard the explosion, but a wave of concussion smashed back at us, and we were thrown completely out of control.

For about five endless seconds I fought the drafts that gripped and tossed us toward the sea. We dropped, climbed, and dropped again as the propeller spun and screamed. We were losing altitude - The water was less than forty feet below -

Then, abruptly, we were free and clear again. Only twenty-five feet above the water, the airplane recovered its balance and motion. We began to skim the waves, gaining speed to regain altitude. I looked back to see what damage our bomb had done to the carrier, and the view was suddenly blocked by the sight of three Jap fighters bearing down on Huber and me - hell bent for destruction!

Futilely I pushed the throttle to its last advance notch, and the speed indicator began to climb to higher numbers; but the highest number on the dial was not high enough, not with the altimeter registering dangerously close to zero.

The Japs came on. Somewhere off in the sky ahead was a cloud bank, a refuge if I could reach it. But we would never make it in time; I knew we were going to get it and get it good. Still, it was a life ring, and I made my grab for it.

I heard the bastards warm their guns up with a few short bursts of fire; they were estimating the range. I knew Huber was still positioning his gun. He was in a bad spot. He was helpless. Their guns began to rattle a jumbled tac-tac-tac-tac-tac-tac-tac-tac...Their many guns against - what? Against a nineteen-year old kid behind a useless weapon. Tracers streaked by us on all sides. >---=em! ---=em!= I heard myself cry out a dozen times. The sound of their machine guns sounded above everything else, a sharp, angry noise. One of them was firing a long, long burst.

>I=M HIT!= Huber screamed. >I can=t aim my gun anymore...=

Hang on! Hang on! The cloud was closer now. I looked back at Huber. God! His face and chest were covered with splashes of blood. I thought he would soon die, and only two hours before -

Another burst, and another, and another. The bullets were close and deadly. They rang alarms as they struck all parts of the ship. The motor began to cough. It coughed four or five times and stopped. The propellor was turning in slower and slower circles. We started to nose down; I had to prepare for a water landing. The fuel line must be shot away. I switched tanks and grabbed for the wobble pump. I almost broke my hand reaching. From his rear seat Huber, wounded as he was, was already working it. The gasoline from the auxiliary tank was pressured to the engine. The motor coughed and caught; the propellor was spinning again. We were still flying!

Behind us the Japs had seen the engine quit, had seen us nose down toward the water. Two of them, thinking we were done, had pulled away. Now only one remained - that bastard!

He brought his plane into position above and before me; about two hundred yards separated us. I still pointed toward the cloud bank, then the Jap turned and roared down toward us, thin little darts of flame spitting from his guns. When he had passed, he turned and came in from the rear. Another burst.

Then something stabbed and burned across my left index finger. I saw my blood start out across it in all directions, but I could tell in a glance it wasn=t serious. Then another something seared and cut across the back of my head. I clapped my fingers to the wound and they came away with blood on them. How long would I live? The last wound was the end. I knew it; I felt it as I felt the blood coursing from my body. But that bastard - he would come with me!

Now that bullets had brought blood from my body, they scared me, and because they scared me I wanted to kill as I never wanted to kill before. That bastard kept firing and firing, and I wanted to smash out his brains against those guns with my bare hands.

He was up there again, still in the same position, safe from Huber=s gun which he thought was still active, and beyond mine. He was preparing for another attack. This time when he turned upon us, I would turn upon him. If my guns didn=t get him I would ram the bastard - he was coming with me!

He swung around to attack and I turned to meet him. Quickly he swerved out of range. Through the static of the broken phones, I heard Huber moan. Maybe I could still get the kid back to base. But the Jap came back. He began to make another pass at us, and again I turned to meet him. He twisted into a loop, and then back into his former position. He was watching us like a vulture, waiting for me to turn for the clouds so that he could rake us again. For a hundred years - my watch must have moved but forty seconds - the game went on. Now he was at us again. I turned like the crack of a whip - I had him in my sights - he was gone in a diving turn. I wheeled for the clouds and, looking back as I entered them, I saw him turn away.

I was flying on instruments - on those that remained. Over my earphones Huber still moaned every now and then. I wanted to get him back. I wanted him to live. How long can the blood of a nineteen year old last when it runs out from bullet holes? The moaning had stopped. I didn=t want to look back.

The last time I had looked his blood-spattered baby face had made me weak.

I tried to contact Midway, but my set had been shattered to uselessness by hot lead. We were flying blind with little more than a compass to guide us. The clouds were thick, impenetrable. I had lost all track of drift figures and as we flew, longer and longer, the dread and helpless feeling that comes with being lost over the sea began to gnaw at what little spirit I still retained. Now and again Huber mumbled something, but I couldn=t make out any of the words through the static and the droning of our engine. What was he saying? This nineteen year old, so close to heaven and so far from home?

I broke through the clouds at regular intervals, hoping to see one of my squadron mates to join on. Neither Midway nor even a landmark to Midway was in sight. There was just sea, broad and blue and endless. The gasoline would give out soon.

Then, *there was a reef!* It was Midway. I began to flash recognition signals so they would know it was a friend that was coming in. I came lower and lower - when all at once I came to the bitter realization that here was not Midway but either Hermes Reef of Kure Island. If it was the Pearl and Hermes Reef we didn=t have enough gas to reach Midway. There was no choice to my guesswork. I flew on the supposition that it was Kure - if only it *was* Kure Island!

It is fifty-five miles from Kure to Midway and I flew those fifty-five miles, and when I was through Midway was not there. I had been wrong in my reckoning, fatally wrong. Half in hysteria I began to execute left-hand turns, trying to figure where I was. There was no reason to it, but nothing had reason anymore. The gas would soon run out. It was running out now. Soon the motor would sputter and stop.

I was in another of those wild left turns when I felt Huber kicking the rudder bar in a righthand direction. I didn=t want to look back at him, but I had to. Mutely and with feeble gestures he pointed to port, to what appeared to be nothing but a black cloud hanging over the water. It looked as if it might be a burning ship, but it would be a good idea to land close by. There would be life-boats down there. I headed toward the black smoke.

Just then a pair of Army Flying Fortresses swept by. I wanted to yell Hallelujah! That was the way I felt. I moved in behind them. They knew the way to Midway and in just a few minutes there it was!

Smoke was still columning up from it in several places. I spiraled down for a landing, when all at once I discovered that the shattered hydraulic system made it impossible to lower the wing flaps to break the speed when we approached the ground. I was getting ready to climb up again to lower the flaps with an emergency manual control, when Huber mumbled again.

Damn the flaps to hell!

We touched ground at high speed, bounced up into the air again, bounced down again, blew a tire, and after rolling a good distance we stopped. Field men dashed toward us, with a stretcher. Gently they lifted Huber from his seat. He was still conscious when they carried him away.

>Do you think he=s got a chance?= I asked one of the men standing by.

The man shrugged. >Maybe; maybe not.=

I was returning from the dressing station when I saw Jesse Rollow coming toward me. >Jesse,= I called out, >how many got back?=

He fell in beside me. >I don=t know, Tom,= he replied in a shocked, toneless voice. >I just got back myself.=

We lit cigarettes and stood watching the sky, waiting for friends to come home.

They came back - some of them...

Major Henderson, Gil Schlendering, Maurice Ward, Tom Gratzek, Dick Blain, Bruce Ek, Paul Hagedorn, Albert Tweedy. They would not fly back any more [Blain and Schlendering actually ditched and were later rescued at sea].

As we walked toward the command post to make our report, Dick Fleming [who would be shot down with his radio-gunner in flames while making good his attack on the heavy cruisers *Mogami* and *Mikuma* the following day] shook his head.

>Eight out of sixteen,= he stated to no one in particular... (Moore 1943, 58-72).

In retrospect, a number of historians of the battle have evaluated VMSB-241's actions

and explored the reasons behind the lack of success and high casualty rate on the part of the marine aviation personnel. Naval aviation historian Barrett Tillman feels that:

> At Midway, the carrier-based Dauntlesses achieved a 30 percent hit ratio against the four Japanese flattops. By comparison, the less experienced Marine pilots from Midway itself (who, in all fairness, had just received [the Dauntlesses] about a week before) attacked in shallower (and hence, longer) glide-bombing runs. As we have seen, the Marines suffered heavy casualties without compensating damage on the enemy. The lesson is clear: technology is less important than training and experience (Cressman et al 1992, 209).

Second World War historian Steve Ewing summed up his evaluation of the Marine Corps= aerial action at Midway as follows:

> Inexperience of the pilots, obsolete aircraft, and a decision to use fighters for the defense of Midway instead of accompanying the strike group on its flight to the Japanese fleet (which left the strike planes bereft of cover) all contributed to the heavy losses and disappointing results achieved by the units operating from Midway. These things, combined with the quality of the enemy fighter pilots and their planes, spelled disaster, particularly for the Marines. However, their sacrifice was not in vain, for their exertions kept the Japanese off-balance and preoccupied, thus interfering with their carrier operations (Cressman et al 1992, 193).

1943: The Carrier Qualification Training Unit at Naval Air Station Glenview

BuNo 2106's history card indicates that the Dauntless was shipped out of NAS Midway Island on 21 June 1942. It was subsequently received at Pearl Harbor on 3 July, shipped to NAS San Diego on 5 July, received there on 22 July, and assigned to ABG-2 on 22 July. It spent some considerable time there before being shipped to and received by the Carrier Qualification Training Unit ACQTU, Pac.≅ pool on 19 January 1943, from where it was transferred to Carrier Qualification Training Unit, Glenview. When it arrived on 8 February 1943. It may have been sometime during the period between its arrival on Midway and its loss in Lake Michigan that it acquired the name *Midway Madness*. Perhaps it was so christened by the unfortunate metalsmith who was assigned to patch all of the holes.

Approaching the end of its short but extraordinarily harsh economic life, BuNo 2106, like many other tired or "war weary" aircraft, was assigned to be used in training future carrier pilots, in this case at the CQTU at NAS Glenview. *Wolverine* (IX 64) and *Sable* (IX 81) were two Great Lakes excursion ships that were converted for use as aircraft carrier trainers on Lake Michigan. *Wolverine* was commissioned in 1942, and *Sable* in 1943 (Van Vleet et al 1970, 115). Both of these flight decks possessed very little freeboard in comparison with the fleet carriers.

The aircraft trouble analysis report summary card at the Naval History Center (NHC) indicates that BuNo 2106 was on station at ACQTU GLN≅ on 11 June 1943 when it was lost. The pilot was 2dLT Donald A. Douglas, Jr., NAVC, USMCR, and the purpose of the flight was for Carrier Qualification Landings at Lake Michigan. The trouble analysis card indicates the date of Douglas= pilot rating as 1943 and states that he had 377.7 total flight hours, with 83.4 total

hours in an SBD-2 at the time of 2106's loss.

As 2ndLT Douglas made his approach to the converted sidewheeler *Sable*, *Sable*'s LSO was not pleased with Douglas' s approach and waved the pilot off. The official finding was as follows:

> Pilot was given a wave-off because he was low and slow. He made a left turn to clear the ship and applied throttle, the engine sputtered momentarily then caught, but due to insufficient speed, he was unable to lift his left wing which hit the water and spun his plane into the lake.
>
> Board attributes 75% to pilot error and technique and 25% to power plant failure, in that had the pilot answered the low and slow signal on the approach he could have made a deck landing. Then after receiving the wave-off had he not banked too steeply, he could have cleared the water.

Douglas was quickly rescued from the water by a Coast Guard cutter standing by as plane guard (Cressman 1994, 24). The accident report summary card indicates that the marine aviator suffered no injuries from the accident, that no one else was involved in the mishap, and that BuNo 2106 was Alost in Lake Michigan.≅ BuNo 2106 was stricken from the BuAer active aircraft inventory on 13 September 1943.

4. Description of the Wreck Site and Recovery of the Wreck

A & T Recovery, acting on behalf of the National Museum of Naval Aviation (NMNA), discovered BuNo 2106 in Lake Michigan on approximately 18 October 1993. NMNA was augmenting its collections by locating and identifying suitable candidates for recovery, restoration, and display. NMNA's research determined that at least 87 naval aircraft were lost in Lake Michigan during the course of NAS Glenview=s Carrier Qualification Training Unit (CQTU, orACarQual≅) exercises during the course of the Second World War.

BuNo 2106,164 feet under the surface of Lake Michigan, at the precise coordinates of 41°58'10", north latitude, 87°10'38", west longitude, was found largely intact, upright, and somewhat settled into the lake bed's sediment. It came to rest on the bottom facing in a southwesterly direction, on an approximate course heading of between 240° and 270°. Both .50 caliber Brownings and a .30 caliber Browning were still intact. The telescopic bombsight and the radio gear were also present. Rudimentary analysis of the wreck revealed that some of the engine panels were missing, the outboard portion of the starboard wing was separated and missing, and the leading edge along the starboard wing displayed some evidence of impact damage (Figure 4). More detailed observations were made from A & T Recovery's video images and a rough diagram of the wreck=s condition was created (Figure 5). Because the tail was slightly elevated off the bottom, it could be determined that the arresting hook was in the Aup≅ position, and that the tailwheel fairing was missing. The upper hatch cover to the parachute flare tube was missing. The canopy was open. The propeller appeared to be in very good shape, and the spinner was still present on the prop hub. Some of the aircraft=s markings were still visible through the mud.

The wreck of BuNo 2106 was identified through its U.S. Navy Bureau of Aeronautics assigned serial number, which was still visible on its vertical stabilizer. Impressive information was subsequently yielded by its Aircraft History Card and its aircraft trouble analysis card, both on file at the NHC=s Aviation History Branch (AVH). As a result, BuNo 2106 was identified as an aircraft of very great significance, thus becoming a prime candidate for recovery by the NMNA.

On 13 January 1994 a diver attached lifting cables to BuNo 2106's rollover bulkhead. Once the rigging arrangement was in place, the still-sturdy craft was pulled off the bottom with the help of a crane. The SBD=s undercarriage was not visible until after recovery, which also revealed that the wheels were locked in the extended position. It was also determined that the tailhook control was oriented so as to indicate that the hook was in the down position. After the craft was set on the dockside, the wings and flexible gun were detached, and the entire aircraft was loaded onto a flatbed tractor and transported overland to Pensacola, arriving at NMNA on 22 January.

At the time of loss the aircraft was crewed by a pilot only; no crewperson was present in the radio-gunner=s cockpit. Since it was recorded that the pilot was rescued unharmed soon after the ditching, those involved in the recovery and investigation process neither anticipated nor encountered human remains. With the exception of a cold engine starter shell discovered within the aircraft, no potentially unstable explosive ammunition of any kind could be found. Overall, the displayed damage seemed wholly attributable to the forced landing and subsequent natural postdepositional processes. The apparent lack of evidence of vandalism or disturbance indicated that there had been no previous salvage attempts.

5. Archaeological Documentation of the Wreck

While previous sections of this report have reconstructed BuNo 2106's colorful past using surviving historical records, this section will concentrate upon what a critical study of the aircraft itself can reveal. The active field-phase of the project extended from Monday, 13 March to Friday, 24 March 1995, and took place at the National Museum of Naval Aviation at Naval Air Station Pensacola, Florida. The documentation team consisted of the author as principal investigator and David Grant as project photographer and researcher. Several months later a second trip was conducted to photograph several items missed on the first trip; Anne Lessmann served as the photographer on that occasion. The team was provided with full access to the museum's facilities. The museum's large staff of employees and volunteers was friendly and extended every courtesy, and all went out of their way to make the team feel welcome throughout the research. The majority of structural documentation work was carried out in the aircraft restoration facility. The majority of historical research took place in the Emil Buehler Naval Aviation Library.

Criteria for Analysis

The project was originally conceived as a full-scale documentation of all of the aircraft's structural features. However, the restoration of BuNo 2106 was well underway by the time of the team's arrival, so, in addition to having to improvise and develop the techniques of research employed during that period, the team was also limited to a two-week window of evaluation

within the aircraft's longer time frame of ongoing treatment at the facility. The restoration may ultimately take several years to complete. Upon arrival it was quickly discerned that, in light of the presence of extensive existing historical documentation and original technical data regarding the design and construction characteristics of SBD-2 aircraft, a comprehensive analysis of all structural *deviations* from what would be expected as typical to this particular aircraft type, based on the body of knowledge containing original manufacturer technical data, comparative surviving aircraft types, historical data, etc, would be more rewarding as well as more economical in light of time and budgetary constraints. It should be noted that although this report attempts to provide as much data as possible on this craft, a two week documentation survey simply cannot hope to provide a comprehensive archaeological and historical analysis, and this study should not be construed as a final report.

In the case of most aircraft production series contracted by the military, reasonably good and often excellent structural documentation exists in the form of standardized limited-distribution technical publications. These technical publications are often organized on the basis of aircraft type and model. The construction specifics of the SBD-2 model series are recorded in detail within the following sources:

X The manufacturer=s factory blueprint drawings. Blueprints for the SBD-2 design are on record in either hard copy or microfiche form at the National Archives and Records Administration (NARA), the National Air & Space Museum (NASM) reference library, the NHC=s Aviation History Branch (AVH), the NMNA=s Emil Buehler Aviation Library, and the McDonnell-Douglas corporate archives.

X The aircraft erection and maintenance manual (AE&M manual≅) and its associated post-production revisions and technical bulletins. There is often such a technical reference for each aircraft model and variant, usually in a loose-leaf binder format. In the case of the SBD-2 model series, Army-Navy serial publication AN-01-45HA-2 comprises the E&M manual. This manual provides a good general overview of the aircraft design and

construction.

X The aircraft=s illustrated parts breakdown catalog (AIPB≅). In the case of the SBD-2 model series, this is Army-Navy serial publication AN-PQ-40AE-3. This manual provides detailed structural information on all of the aircraft=s major components.

X The aircraft=s structural repair manual (ASRM≅).

X The aircrafts= pilot's manual (APM≅).

X Another useful source of comparison can be other extant aircraft of the same type, especially the closest comparable model examples (although not all aircraft of the same model are necessarily identical). In this case, however, no other SBD-2s are currently accessible for comparative study.

To a lesser extent, historical information detailing a particular aircraft=s operational life can be gleaned from the following items:

X The aircraft=s maintenance log. These are usually very difficult to obtain, and in this case one was not found for BuNo 2106.

X Individual aviator flight logs. These also can be very difficult to obtain, but in the case of this aircraft, one of 2106's principal assigned pilots was located, and he made his flight log available to the NMNA. The NMNA has a number of flight logs in its collection, but the collection is not, and can never be, comprehensive.

X Other historical sources. In the case of this particular aircraft, a fairly large number of secondary historical sources proved useful in researching the history of the aircraft.

X And of course, the aircraft itself can be a compelling source of material evidence if it is evaluated in a proper manner.

Since detailed information concerning BuNo 2106's design and construction specifics are already contained within the previously mentioned sources, the following sections will emphasize identifiable post-production alterations and anomalies. Therefore, the assessment and categorization of structural evidence within SBD-2 BuNo 2106 is based upon the following

criteria: (1) initial evidence of identification present on or within the wreck; (2) attitude of the aircraft at time of loss; (3) associated equipment on board the craft at the time of loss; (4) evidence of damage, alteration, and/or replacement incurred during the economic lifetime of the aircraft; (5) damage attributable to the wrecking of the aircraft; (6) parts found to be damaged or absent at the time of recovery; (7) a general paint analysis of the aircraft; and (8) evidence of post-depositional structural decay of the aircraft materials. The following sections; will attempt to examine these evidence categories in detail, will explore differing aspects of the aircraft=s physical condition at the time of its recovery, and will attempt to categorize and distinguish between those forces which caused the aircraft to be in its current condition. It should be noted that while much information was obtained on a firsthand basis, it became necessary to gather some information through a critical analysis of previously compiled NMNA photographic documentation. Signifying the necessity of photographic documentation during any reconstruction or conservation process. In most instances the photographs from which the information was drawn are provided. These sections will be followed by some general conclusions which can be drawn from the historical and archaeological analyses. Alterations observed in the craft=s historic integrity resulting from the current restoration will be discussed in the conclusion, which explores preservation and management issues and recommends future avenues of research.

Evidence of Identity-

In the absence of definitive aircraft manufacturer or military agency serial data plates,

three types of evidence were used to confirm this craft's identity as that of BuNo 2106: (1) model identification, (2) paint coating application evidence, and (3) structural damage evidence.

In terms of model identification, the subject aircraft displayed the unmistakable design and structure of an SBD-2, of which only 87 were constructed. Through a process of elimination the destruction of many -2s was confirmed and leaves a very limited number of potential candidates for this individual -2. Furthermore, of the surviving aircraft of this model type, records indicate that a total of five SBD-2 aircraft were lost in the geographical confines of Lake Michigan. These were BuNos 2106, 2111, 2117, 2183, and a fifth Dauntless identified as 2173, which may be a misidentification as BuAer records indicate that 2173 was lost in the Pacific during service with *Hornet*=s Bombing EIGHT.

In terms of confirming this aircraft's origins, its identity and history are verified on the basis of its overall construction characteristics as an SBD-2 model. The following identifying marks confirm this SBD-2 as BuNo 2106.

> U.S. Navy Bureau of Aeronautics serial number (BuNo) of A2106≅ in several paint layers on the tail
>
> Additional paint and marking residue, including yellow peace-time paint colors on wing center panel leading edges, yellow paint behind the rear machine gun well, lower paint-layer remains of the side code AB-7," and the unofficial name A*MIDWAY MADNESS*≅ painted on the cowling.
>
> The location, nature, and severity of projectile-related damage.
>
> Comparable historical written and photographic evidence, specifically regarding particular areas of damage.
>
> The context of its loss and recovery.

Based on this evidence it is believe the aircraft in question is indeed BuNo 2106, the fifth numerical production Douglas SBD-2 model airframe in the -2 Dauntless progression. The

aircraft is a veteran of the prewar and early wartime *Lexington* Air Group's Bombing Squadron TWO (VB-2). It is a survivor of enemy action at Pearl Harbor, known to have been present on Ford Island during the Japanese attack 7 December 1941, and a participant in the Lae-Salamaua (New Guinea) Raid on 10 March 1942. It constitutes the only extant accessible SBD-2. It furthermore comprises the only extant surviving naval craft of any type known to have participated in the Battle of Midway, waged on 4-6 June 1942.

In terms of paint evidence, specific identifying markings, general color pattern applications, and paint layering characteristics conclusively identified the aircraft. The operating military agency is indicated by evidence of applications of ANAVY≅ to both sides of the vertical fin (Figures 42, 44). The individual BuAer aircraft serial number is indicated by the multiple overlaid applications of A2106≅ to the same vertical fin surfaces (Figures 41-44). The aircraft=s squadron organization code AB-7≅ was painted on both sides of fuselage (Figure 8), and the ship number A7≅ was likewise painted on the starboard side of the outer cowling ring (Figure 12), and on the port wing center panel leading edge (Figure 7). The aircraft=s unofficial name of A*MIDWAY MADNESS*≅ is applied to the port outer cowling ring in lack paint (Figure 39). The exterior Blue Gray over Light Gray paint coatings were worn through in some areas to reveal earlier, different color schemes. The starboard center panel leading edge, in particular, showed signs of extensive paint wear (Figure 45). The yellow paint visible beneath the later coatings on the starboard center panel leading edge corresponds with BuNo 2106's recorded prewar mission. The yellow paint discernable on the aft fuselage and empennage beneath later camouflage applications is consistent with the peacetime identification color coding system which distinguished the *Lexington* Air Group (Figures 41, 44, 46). The paint coating evidence of BuNo

2106 will be explored in detail in a later section.

Attitude of the Aircraft at Time of Loss

At the time of the aircraft=s ditching, a number of control surfaces and components were oriented in specific positions. The landing gear was fully extended (Figure 8). The flaps were intact and found to be set in a Adown≅ position (Figure 15), in agreement with the positioning of the pilot=s flap selector controls (Figure 183). Although the arresting tailhook at first appeared externally to be in the Aup≅ position, upon further study the interior control was found to be locked in the trap or Adown≅ position (Figures 145, 179). Subsequent analysis of photographs taken during recovery show that the hook may possibly have been forcibly bent just aft of where it entered into the actuator fairing, most likely as a result of the crash (Figure 9). The cowl flaps were partially open (Figure 39). The forward canopy was retracted in the open position and remained somewhat intact, despite structural damage and corrosion (Figure 8). The orientation of the hood also undoubtedly reflects 2dLT Douglas=s emergency abandonment of his sinking craft. The aft retractable canopy section was not present at the time of recovery, thus its orientation at the time of loss could not be determined. The flexible-mount .30 was in an unstowed position at the time of recovery, although the reasons for this are not clear in light of the absence of a backseater at the time of loss (Figure 9). One explanation for this may be that the gun was projected outward and forward upon impact during the ditching, or that divers pulled the gun out of its well during the rigging for recovery. The radio-gunner=s control stick was detached and stowed in its storage position against the port cockpit wall (Figure 196). Upon

recovery there were also scraps of what appeared to be a canvas-type textile in the aft cockpit of the wreck (Figure 204). It is possible that these fragments may represent evidence that the aft cockpit was battened down with the manufacturer-provided protective snap-on coverings at the time of loss (Stern 1988, 27).

Associated Equipment on Board the Craft at the Time of Loss

For the purposes of this report, associated equipment is defined as any equipment which was particularly sensitive or unusual, or which was intended to be detached, inspected, maintained, recalibrated, or replaced during the operational life of the aircraft.

Upon recovery the aircraft was found to contain a GP-4 radio unit and its associated electrical equipment (Figures 213-215, 218-225, 229-238), a telescopic bombsight (Figures 131, 171, 172), the pilot=s retractable chart table and navigational aids (Figures 175-176), two fixed forward .50 caliber Browning machine guns (Figures 28-31), and one aft flexible .30 caliber Browning gun (Figures 246-263). Other associated artifacts present included at least one Mark IV float light (Figure 214), a two-person life raft (Figures 264-266), and the raft=s accompanying survival kit (Figure 269). The survival kit included a sail, oars (Figure 271), a life raft repair kit, a fishing kit (Figure 271), a Very flare gun (Figures 272-275), a handheld signaling mirror, a Police Special whistle (Figure 270), a Boy Scouts of America knife (Figure 270), and other gear. The life-raft cylinder still contained compressed air when recovered. No ammunition, explosives, or pyrotechnics other than one shotgun-type shell, its purpose unconfirmed, but probably a starter shell for cold-starting the aircraft or less likely a Very shell, were found to be present in the aircraft. No issued flight equipment or personal material relating

to individual aircrew members was found.

Evidence of Damage, Modification, and/or Replacement Collected During the Operational Lifetime of the Aircraft

For the purpose of this report, a structural deviation is defined as any damage, modification, and/or replacement of components not attributable to the aircraft=s loss. This damage must have occurred previous to the ditching and subsequent crash. This type of damage has been defined as foreign object damage (FOD). FOD encompasses damage related to impact or collision, the result of projectiles or shrapnel from fragmented projectiles, and areas or patterns of long-term wear other than the final crash.

An inventory and photographic catalog listing evidence of repaired damage, was compiled as part of this study (see Figures 276-396). Upon comparison, researchers discovered that the areas of repair in the structure of the artifact, matched those areas of projectile-related and other damage visible in the three photographs of the craft taken on 7 June 1942. Through this photographic documentation, five types of evidence are treated in this report: (1) repaired FOD, (2) components containing particular maintenance data or inconsistent model information, (3) unusual differential corrosion patterns, (4) unusual powerplant maintenance evidence, and (5) miscellaneous evidence.

Repaired Foreign Object Damage

The following repaired FOD evidence is presented largely in the same order used for the photodocumentation portion of this report. The reader is referred to the referenced illustrations for a more detailed treatment of some aspects of this evidence. For the sake of orientation, general illustrations of subject areas are also included in order to provide a frame of reference to understanding the many detail-oriented illustrations. These reference illustrations include the airframe=s port (Figures 276-280), starboard (Figures 281-284), and firewall (Figure 285) aspects. Overviews of the wing center panel=s port (Figures 341, 347) and starboard (Figure 359) construction are also provided for reference, as is that of the tail cone (Figure 313). Additionally, three diagrams (Figures 397-399) provide an overall picture of the distribution, concentrations, and patterns visible in the repaired projectile damage evidence.

Twenty-one patches were documented in the port side, fuselage, exterior, surfaces (Figures 286-301, 304-306). Twenty-one patches were likewise documented in the starboard side fuselage exterior surfaces (Figures 324-336).

Eight patches were identified on the upper exterior surface of the starboard center panel (Figure 359). Eight areas of repaired damage were discovered within the starboard side internal construction of the center panel spars and ribs (Figures 360-366). In addition a fuel tank strap displayed damage that might have been caused by a projectile and was not repaired (Figure 361).

Eight patches were identified on the upper exterior surface of the port center panel (Figures 341-346). Eight areas of repaired damage were discovered within the port side internal construction of the center panel spars and ribs (Figures 349-358). Four patches were isolated on the cockpit firewall (Figures 337-338, 340), as well as one additional area of possible modification (Figure 339).

Two patched areas were identified within the internal tail construction; these were on the station 242 3/8 bulkhead (Figures 302-303) and the station 271 bulkhead (Figures 307, 309). Four patches were visible on the vertical fin aft face (Figures 310-311) and a fifth was discovered within the fin=s internal construction (Figure 312). Three areas of repair were identified within the tail cone structure (Figures 314-317), as well as a fourth unrepaired area of FOD. Two areas of repaired FOD were visible in the rudder frame (Figures 321-322). One patch was visible on the surface of a horizontal stabilizer (Figure 319).

A total of 18 areas of probable FOD were identified within the fore and aft cockpits and inter-cockpit structures (Figures 377 to 396), as well as two areas of apparent modification (Figures 376, 396). Two of the FOD areas in the aft cockpit and bulkhead consist of unrepaired, multiple projectile, perforations (Figure 391) in groups of three (Figures 392) and five (Figure 393).

The forward cockpit instrument housing assembly showed evidence of projectile damage in the form of patches. The housing's upper cross struts showed evidence of repairs made while in the field away from professional metalsmiths. Four particular areas of repair were identified within this structure (Figures 368 to 374). One unrepaired example of FOD was identified in an aft fuselage internal frame (Figure 34). This FOD may have remained unrepaired because of a difficulty in access.

At the time of the initial visit, the outer wing panels were being refabricated in an out-of-state metal shop therefore they were not available for study. The restoration staff remarked that both of the outer wing panels were not those of the original factory airframe construction, but rather they were thought to be manufacturer=s replacement panels. Individual serial construction

numbers of these panels are unknown at this time. An analysis of photographs taken following the aircraft=s arrival in Pensacola suggests the existence of what may be a rough sheetmetal patch on the inboard upper surface portion of the port outer wing panel (Figure 38). However, if at least one of the outer wing panels had been replaced following the Battle of Midway, it would likely have been the port panel, as historical photographic evidence indicates that was the one damaged in the crash landing. If at least one of the panels does contain evidence of repaired damage, further investigation is recommended.

Components Containing Particular Maintenance Data or Inconsistent Model Information

Components that have specific service dates or locales stenciled or stamped upon them, or which are labeled with a model designation inconsistent with that of the original airframe, can reveal valuable information regarding an individual aircraft=s history. Component installation or service dates and maintenance facility codes can be compared to the dates recorded on an Aircraft History Card to confirm an aircraft=s assignments. In some cases such evidence may reflect maintenance that was performed on the craft due to combat-related damage. In the case of BuNo 2106, particularly revealing evidence was found on the inboard wing fuel tanks, at least one inboard wing tank liner, the oil tank, and the starboard outer wing panel attaching bulkhead. Specifically, upon inspection it was discovered that the inboard wing tanks and liners, and the oil tank, were later fitted SBD-3 and -4 model parts.

In the center panel, evidence of extensive repaired projectile damage was present in the upper surfaces and internal spars and stringers of the panel=s outboard portions. This damage

most probably indicates the reason for the replacement of the original inboard fuel tanks and liners. The port inboard wing tank was found with a data plate affixed to it that is stamped ASBD-4≅ (Figure 85). The port tank also has stenciled upon it A12-15-42≅ and ANAS SD.≅ These marks may correlate with the period of time that BuNo 2106 spent at the NAS San Diego aircraft overhaul facility, as indicated by 2106's Aircraft History Card. Evidence of extensive projectile damage is still evident in the upper center panel surfaces and interior structures. The starboard, inboard tank displays a stenciled A6/30/42≅ (Figure 80), which coincides with a probable tank and liner replacement following the Battle of Midway 4-6 June 1942. One of the inboard rubber tank liners was stenciled with ADOUGLAS AIRCRAFT CO. INC. MODEL SBD-3 FUEL CELL≅ (Figure 88). This replacement also was very likely necessary as a result of projectile damage related to the Midway engagement.

The chronology of this replacement is also consistent with the fact that SBD-2s were being phased out of service by the period of the stenciled dates, during which time the SBD-3 and -4 were the dominant models of the Dauntless series. No doubt this also carried over into parts availability, and a high degree of parts interchangeability is suggested. The data plate affixed to the oil tank is stamped ASBD-3≅ (Figure 25).

When the outer wing panels were removed from the aircraft, directly following its recovery, a pencil inscription was revealed on the attaching bulkhead of the starboard wing, outer panel was revealed. The mark ABD-2≅ was inscribed with graphite pencil onto a surface primed with green, zinc chromate (Figure 20). The exact nature of this mark has not been determined, however, it may indicate a parts tracking number.

Differential Corrosion Evidence

Four parts displayed an unusually advanced state of corrosion. These have been identified as replacements during the aircraft's service life. This assumption is based on the theory that damaged quality factory parts could have been replaced while in the field.

Upon recovery, components found in an unusually advanced stage of corrosion, in comparison to the vast majority of relatively well preserved components, included the lower leading edge fairing of the vertical stabilizer (Figures 98 and 99), the fourth rib from inboard on one of the elevators (Figure 100), and one rib within the rudder frame (Figure 323).

A second rib within the rudder frame also appeared not to be of the aircraft=s original construction, but to have been replaced at some point (Figures 320, 322). While the rivets joining this rib to the frame may have been original, they had been primed over, making it difficult to determine their *provenance*. It is possible both ribs were found in a corroded state, and were both replaced by the NMNA veteran metalsmiths, following the museum=s recovery of the craft.

Powerplant Maintenance

Due to extensive corrosion, the engine serial number could not be obtained. Despite this obstacle it is reasonably certain that this was not the original powerplant WAC serial number 4689. According to the aircraft’s history card, serial number 4689 was changed to engine number 5123 between 5 and 12 December 1941, and was retained until at least 22 July 1942, the last entry documenting the plane’s powerplant. It is possible that the aircraft underwent further engine changes, therefore it is impossible to identify this engine as serial number 4689.

At the time of recovery, an anomaly was noted in the case of the engine safety wire rigged to the crankcase of BuNo 2106. This wire was initially determined as installed backward or in an inappropriate manner.

> …the safety wire installed on engine case bolts of 2106 was installed backwards, pulling in a counter-clockwise direction. (FN Millbrooke 1995 [draft], 41)
>
> …on the SBD-2 [recovered from Lake Michigan], the safety wire connecting the engine bolts, intended to keep the bolts from backing out, is installed backward on the entire engine. (FN Whipple 1995, 12)

The usual method of rigging looped the safety wire through a series of bolts in such a way that the tension pulls them in a clockwise, or tightening, direction. (FN David Whipple, personal communication to Rich Wills, 1995). It would appear from photographic evidence that the safety wire configuration on BuNo 2160 was a much simpler arrangement, but not one with a clear tension advantage. The wire was rigged directly from bolt-head to bolt-head with a right handed twist. The safety wire was only observed in the nose portion of the crankcase. It is possible that the safety wire was rigged differently on another section.

Miscellaneous Evidence attributable to long term use.

The buildup of metallic residue on cowling insets is perhaps attributable to the long-term muzzle exhaust deposition of the aircraft=s forward-firing .50 Browning machineguns. These deposits probably accumulated over the course of the aircraft=s operating life from muzzle flash residue.

Damage Attributed to the Wrecking Process

Damage that may be attributed to the wrecking process includes damage to the prop, spinner, cowling elements, and associated engine compartment components; structural deformities and separations evident in the outer wing panel and center panel structures; apparently forced retraction of the tailhook; the loss of the aft canopy; and the Afrozen≅ readings evident in some instrumentation mechanisms.

The absence of the starboard upper and the port lower inner cowling ring/engine access panels, and the pushed-in attitude of the remaining ones seem to indicate that the engine mount was sprung in the crash causing buckling of the cowling elements. The crash may also explain the flattening of the starboard shell ejection chute that may have been crushed from the torque transferred by the propeller and shaft to the powerplant, mount, and firewall assemblies.

The aircraft's wing structures displayed distinctive effects attributable only to the crash. Evidence of those effects includes a forced separation of the outermost four-foot section of the starboard outer panel and wingtip from the rest of the wing, and apparently the complete separation and loss of the starboard outer wing panel=s outboard portion and tip. Furthermore, at the time of recovery, the port aileron was found to be somewhat deformed, and structural deformity was observed on the upper skin surface of the port outer wing panel toward the tip (Figures 13, 38). The nature of this deformity suggested that the interior spar structure was forced upward and aft into the interior surfaces in a way that left an impression in the upper surface of the panel. According to the aircraft=s trouble analysis report summary card, the aircraft loss involved the pilot=s inability Ato lift his left wing which hit the water and spun his plane into the lake.≅ While the left wing hitting first seems at odds with the extensive damage to

the right wing, this damage may make sense when the nature of Aspinning in≅ is considered. The pattern of damage may indicate that the very tip of the slightly deformed port wing initially caught the water, changing the aircraft=s trajectory so that much of the momentum was transferred disproportionately to the opposite side of the craft. This action may have caused the aircraft to be flung toward the water in a more extreme angle which caused the starboard wing, cowling, and propeller structures to take the full force of the impact. This may account for the characteristic Asawed off≅ appearance of the starboard wing tip.

It is significant to note that the propeller is not corkscrewed as the engine was not running at the time of impact according to the pilot. All three blades show a minimal degree of warpage, and the blade that shows the most deformity is the one in the lower starboard orientation at roughly between the four and five o=clock positions, when read from the cockpit. It is also interesting to note that several other single-engine propeller-driven aircraft that have been recovered by NMNA from Lake Michigan show particular damage signatures. The General Motors FM-2 Wildcat BuNo 55052, for instance, appears to have hit the water with its propeller still spinning at a high rate of rotation, as its prop blades are corkscrewed in a counterclockwise direction when read from the cockpit (Figure 417). This wrecked Wildcat also displayed an aft section of the port fuselage crushed in, while the visible wing damage appears to be to the starboard wing (Figure 418). This type of damage suggests a type of transferred backspin on the aircraft following impact with the water surface. One veteran naval aviator and landing signal officer (LSO) interviewed, felt that this process was indicative of the way ditched aircraft tend to respond to high impact with water (personal communication, CAPT R.L. Rasmussen USN (Ret) to Rich Wills, 1995).

However, this is not true of all ditched aircraft. Apart from the corkscrewed prop, SBD-3 BuNo 06626 portrays a different scenario that may account for its rather severe appearance (Figure 407). Its appearance suggests it was ditched in the path of, and keelhauled beneath, a moving vessel. This would coincide with the aircraft's accident report which indicated a loss of power and ditching immediately following takeoff from an underway aircraft carrier.

The previously mentioned bend in the tail hook is another piece of evidence that displays damage caused by ditching. This bend may indicate that the hook was locked down at the time that the aircraft hit the water. The force of the impact may have bent the hook upward. This theory seems plausible in light of the trouble analysis card=s summary indicating that 2dLT Douglas stalled the aircraft immediately following an unsuccessful attempt to trap aboard *Sable*.

The aircraft most likely sank bow-first; a tendency common to fixed-wing aircraft with a single powerplant mounted forward. The aft canopy was probably closed at the time of the ditching, and may have been forced from its tracks in the impact or especially if the aft gun was forcibly unshipped and thrown out of and forward from its well, during the descent to the bottom. It is likely the aft gun was forcibly unshipped and thrown out of its well, dislodging the canopy in the process. The gun well doors, the parachute flare tube, topside fuselage access hatch, inner cowling ring/engine access panels, wing tip, and the missing canopy elements, may still remain on the bottom of Lake Michigan. Whether these components were lost as a result of the ditching or as a result of long-term structural erosion is unknown.

Readings preserved in the aircraft=s sensitive cockpit instrumentation may in some cases attest to what was last indicated at the time of the crash. It is important to note that readings on a spring loaded instrument, such as the tachometer, can be the result of spring corrosion. Geared

instruments, such as the altimeter or airspeed indicator may display a true reading due to their more durable nature.

The team conducted only a superficial analysis of the cockpit instruments based on photographs provided by the NMNA restoration staff. The instruments were not subjected to microscopic examination for dial and pointer marks, or for captured internal mechanism orientations. Some navigational instruments indicated readings that were likely captured at the time of the crash. Although the forward cockpit altimeter was discovered without its needle, needle corrosion evidence on the dial face and the position of the rotating hundredths dial, suggest that the instrument stopped, corroding into place while registering a reading of between 294 and 295 feet (Figures 155-156). The aft cockpit altimeter was also examined, but it was found in a state that made interpretation difficult (Figure 194). Although the hundredths and tenths of feet are indiscernible in NMNA photographs, on the aft altimeter the last character seems to be an 8 or a 9. It should be again noted that while altimeters are sometimes more likely to capture an aircraft=s last readings at time of impact, the possibility does exist that a gear separation may have occurred giving a false reading.

The turn and bank indicator was frozen portraying the aircraft at a starboard angle (Figures 151-152). This reading may have resulted from the backspinning motion described earlier. The rate of climb indicator was found not stopped at zero, although from the photographs it is difficult decipher its exact position (Figures 153-154). The cockpit engine gauge unit registered a reading of 60^{o} celsius (Figures 163-164), while the engine temperature gauge registered a higher reading of approximately 150^{o} celsius (Figure 170). The oil and fuel needles were both missing from the face of the cockpit engine gauge unit. The manifold pressure gauge

appeared to be seized at a reading of 2800 inches of mercury (hg) (Figures 165-166). The tachometer seemed to display a reading of slightly under 650 rpm (Figures 167-168). If the tachometer reading was true the instrument may have been unwinding when the aircraft wrecked. However, it is important to note that a tachometer is a delicate, spring-loaded mechanism that relies on the aircraft's electrical system, and therefore may not display a true reading. Furthermore, as the propeller blades showed no visible evidence of corkscrewing, it would appear that the reading is false. The aircraft's radio equipment was not examined for power, function, frequency, or other settings.

Parts Found to be Damaged or Absent at the Time of Recovery

A number of components were found damaged or entirely absent during the aircraft's recovery. The starboard outer wing panel exhibited evidence of having been violently separated from the rest of the panel (Figure 11). The severed outboard portion of the outer panel was recovered (Figure 36), but its wing tip assembly was not. It can be presumed that both instances of structural separation occurred as a result of the same incident. Damage encompassed almost the entire leading edge of the starboard, outer, wing panel (Figure 21). The underside of both outer wing panels displayed collision surfaces (Figures 8, 11), with more severe damage to the starboard panel. Wing warpage evidenced in the lower surfaces of the outer wing panels extended to a slight deformity in the central area of the lower portion of the starboard center panel (Figure 80). A somewhat worse degree of warpage is present in the lower surface of the port center panel, located slightly more aft of center than its opposite (Figure 86).

The airscrew and spinner were still articulated on the shaft upon recovery. The exterior surface of the spinner was crushed inward (Figure 23). The lowermost propeller blade was found warped in a slightly aft direction (Figure 10). There were concentric radial abrasions on the forward surfaces of the prop blades (Figure 7). These abrasions may represent long-term wear. The engine cowling assembly was dented in the lower center, and starboard areas of the outer and inner cowling rings (Figures 23, 25). Some of the inner cowling ring/engine compartment access panels were missing (Figures 6, 8, 24), and others showed evidence of being forcibly crushed in (Figure 25). The expended ammunition component ejection chute, on the starboard side of the firewall=s forward face was found partially crushed at its lower extremity (Figure 52).

In addition, the port side forward fixed gun compartment door was missing when divers located the plane (Figures 28, 29). The very tip of the wooden mast appeared broken off (Figure 8), however, this was, in fact, its original design. Salvage divers found the cockpit windscreen mostly disintegrated (Figure 7). One Plexiglas panel was broken in the pilot's retractable overhead canopy assembly, and at least two other panels were fractured (Figure 9). The aft retractable canopy was entirely absent (Figure 9). The aft gun well doors were both missing (Figure 6). The upper fuselage access hatch to the parachute flare tube station was missing (Figure 6). The two lower fuselage covers to the parachute flare tubes were seen hanging by their actuating cables during recovery (Figure 9), but photographs indicate that they disappeared soon after the aircraft broke the surface (Figure 15); most likely falling back to the lakebed. The pilot's underside viewing window was cracked (Figures 14, 57). The tail wheel fairing was not present (Figure 9).

General Paint Analysis of the Aircraft

Upon recovery, BuNo 2106 displayed the basic two-tone exterior Blue Gray over Light Gray camouflage scheme used by the Navy during the early portion of the Second World War (Figure 8). There also appeared a number of identifying markings were present on the aircraft=s exterior fuselage in various forms. The internal faces of the flap and dive brake control surfaces were painted Insignia Red (Figure 15). The cockpit, internal fuselage, and inner wing structures were coated with green zinc chromate primer (Figures 17, 20). The instrument panel was painted with a matte black finish. A non-slip surface was applied to the wing walkways (Figure 7) and survived the time underwater.

A distinct stratigraphy of previous paint application patterns was visible beneath the uppermost paint scheme of Blue Gray over Light Gray and its associated markings. During the cleaning of the aircraft's fuselage, evidence of Sea Gray paint became visible beneath the surface paint coat. Below the Sea Gray level were even earlier applications of yellow paint on the leading edge of the starboard center panel (Figure 45), portions of the aft fuselage (Figure 40), and on the vertical fin (Figure 46).

A number of informative identifying markings were on the aircraft in a distinct stratigraphy. Multiple stencils of ABuNo 2106≅ were visible on the upper portion of the vertical stabilizer (Figures 41-44), representing at least three overlays of the Bureau Number on the starboard side (Figure 43) and four overlays on the port side (Figure 44). Some of the layers were applied with white paint, while others were applied with black paint. The side code AB-7≅ (Figure 9) was applied in white paint to both sides of the fuselage. The ship number (or LSO

reference number) A7≅ was painted in white on the inboard, leading edge, of the inboardmost portion of the port, outer, wing panel (Figure 10) as well as on the starboard side of the outer cowling ring (Figure 12). National insignias in the white star-on-blue field format were present on both sides of the aft fuselage, and upon all four wing surfaces (Figures 8, 11, 48). A red landing assistance stripe was applied to the base of the vertical stabilizer (Figure 44). The craft's unofficial name, A*MIDWAY MADNESS*,≅ was stenciled in black letters on the port side of the outer cowling (Figure 39).

Interpretation of Paint Coating and Marking Stratigraphy

Five general chronological stages of development can be seen in the application of paint coatings and markings to this aircraft over the course of its economic life: (1) colors and marking patterns applied at the time of manufacture circa 1940, (2) peacetime Navy colors and marking patterns circa 1940-1941, (3) wartime Navy colors and marking patterns circa 1941-1942, (4) wartime Marine Corps alterations of previously applied markings circa 1942, and (5) wartime San Diego and/or NAS Glenview alterations of previously applied coating and marking patterns circa 1942-1943.

Evidence of Paint Coating and Marking Patterns Applied Approximately at the Time of Construction (1940)

According to the Erection & Maintenance manual for SBD-2s, paint applications

followed BuAer specification SR-15C. This specification required one coat of 2-C primer (two coats for flying surfaces) and two coats of M-485 non-specular gray lacquer for exterior surfaces; one coat of zinc chromate primer and two coats of aluminized lacquer, two coats of primer on the fuselage interior; with black lacquer over primer for the walkways, steps and handgrips. Also, the wing walkways were covered with no-slip strips. BuAer specification SR-2A designated that Navy aircraft should have Navy insignia and markings applied according to their specifications (Douglas Aircraft Company, Inc., 1941, 298-303). A photograph of the first SBD-2 constructed, BuNo 2102, indicates that at least one SBD-2 was coated very early with aluminum paint on the fuselage and chrome yellow paint on the wings (Stern 1988, 10). In addition to being a general characteristic of some peacetime Navy fleet aircraft, yellow wings also denoted a test-bed configuration. As this was the first SBD-2, and it was initially assigned to NAS Anacostia, MC for test purposes, this could explain why 2102 had yellow wings (Chief, Bureau of Aeronautics to Commander, Aircraft Battle Force, ASBD-2 Airplanes, Contract 65969, Allocation of,≅ 9 April 1940).

In general, there does not appear to have been a single standardized application specification for the stencilings on the tail of the aircraft throughout the war. Occasionally, however, some bases did standardize this process. NAS San Diego's Local Processing Specification Number 128, dated 8 March 1940, designated the size and location of these applications. While no stipulation was listed for the SBD aircraft type, the BT-1 type was required to have service identification letters six inches high, four and a half inches wide, and with a stroke of one inch; model designation characters three inches high, two and a quarter inches wide, and with a half-inch stroke; and bureau number characters three inches high, two

and a quarter inches wide, and with a half-inch stroke (Elliott 1989, 85-88). A manufacturer=s photograph of BuNo 2102 provides a suggestion of where the first applications of these markings may have appeared on the empennage of 2106. In this photograph, the number A2102≅ is stenciled on the fin, the designation ASBD-2≅ is stenciled on the rudder, and AU.S. NAVY≅ is applied in somewhat larger letters than the previous two markings, beneath the horizontal stabilizer where the fuselage and tail cone are joined (Stern 1988, 10).

Whittier tentatively recorded his recollection of early SBD-2 paint schemes as follows:

> When I took delivery of the first SBD [assigned to VB-2] (#2105) it was painted dull-matte blue (non-spectral paint) on surfaces viewed from the top. The surfaces viewed from below I believe were gray, but I wouldn't fight anyone who recalls that the belly, etc. was blue also...
>
> There is a faint recollection that Douglas in the early days of the SBD production line...painted [the aircraft] silver with yellow wings - organizational markings such as yellow tails (*Lexington*), nose cowl, belly stripes, etc. (Letter, CAPT Mark T. Whittier USN(Ret) to CAPT R.L. Rasmussen USN(Ret), 9 February 1994).

The physical paint evidence found on the exterior of BuNo 2106 seems to support Whittier=s faint recollection.

Evidence of U.S. Navy Paint Coating and Marking Application Patterns (1940-1942)

The prewar paint scheme generally in use at the time of 2106's delivery consisted of Light Gray metal surfaces, Aluminum dope fabric surfaces, and Orange Yellow upper wing surfaces extending down and around to include the leading edge (Elliott 1989, 22-23). The yellow paint present on the leading edge of 2106's starboard center panel is likely what remains of the aircraft's standard peacetime colors. A weapons test-bed configuration seems unlikely in

the case of 2106.

The origin of the Lemon Yellow residue that was discerned on the tail area surfaces can also be theorized. By 1937, due to the growing number of aircraft carriers and air groups, the Navy began distinguishing between these air groups by assigning them differing tail color codes. The tails of aircraft from the *Lexington* Air Group were painted yellow. This tradition was in effect at the time of BuNo 2106's arrival to the fleet, and very likely accounts for the evidence of Lemon Yellow paint on 2106's aft fuselage and tail surfaces. The early fleet carrier aircraft tail codes are displayed more fully in the following table:

Tail Color Identification Codes for Carrier-based Naval Aircraft, 1933 to 1941

Lexington (CV-2)	Lemon Yellow
Saratoga (CV-3)	White
Ranger (CV-4)	Willow Green
Yorktown (CV-5)	Insignia Red
Enterprise (CV-6)	True Blue
Macon (ZRS-5)	Black (1933-1935)
Wasp (CV-7)	Black (1937-1941)

(from Swanborough and Bowers 1969, 38)

On 1 July 1937 each carrier-based squadron was assigned the same number as the hull number of its carrier. The squadrons of each carrier were collectively identified as carrier air groups and were identified by the name of the carrier, such as *Lexington* Air Group. Totally autonomous numbered air groups came into use in late 1942. Each carrier air group was

commanded by an air group commander (AGC, or ACAG≅), also identified with the ship=s name. *Lexington*=s AGC was called Commander, *Lexington* Air Group, or ACLAG.≅ *Yorktown*=s was CYAG, *Enterprise*=s was CEAG, *Hornet*=s was CHAG (pronounced Asea hag≅), etc. Their aircraft were usually coded with the markings AGC≅ or a personalized variation of the same (Thomas 1989, 21-22).

Due to the growing prospect of American involvement in global conflict, on 30 December 1940 the Bureau of Aeronautics issued instructions that the color scheme applied to all Navy ship-based fleet aircraft be changed from their normal bright markings to an overall non-specular Light Gray (or Sea Gray) camouflage, with white alphanumeric markings, and national insignia roundels in four positions (both sides of fuselage, and the upper port and lower starboard wing surfaces) (Stern 1988, 12, 25; Elliot 1989, 28). Whittier confirms this change in this following recollection shortly after delivery of the new aircraft:

> It wasn't long - a mere matter of months - before we had them in the paint shop for an overall gray paint job as Navy was quite undecided on what was the best disguise at the sea (Letter, CAPT Mark T. Whitter, USN (Ret) to CAPT R.L. Rasmussen USN (Ret), 9 February 1994).

On 20 August 1941 a superceding order was issued by Commander, Aircraft Battle Force (ComAirBatFor) that now directed that AirBatFor carrier-based aircraft were to be painted nonspecular Light Gray except for those surfaces seen from above, which were to be painted nonspecular Blue Gray. An abrupt transition between the two colors was prevented by feathering the colors together at their contact point (Elliott 1989, 29). The two-tone paint scheme of Blue Gray over Light Gray remained in effect from May 1942 until January 1943 (Elliott 1989, 30). These orders probably account for the gray paint layer that was discovered beneath the exterior

blue paint layers on portions of BuNo 2106's fuselage. This evidence suggests that when a repainting order was given, this aircraft was simply painted over and not stripped of the previous coats.

In terms of the personalization of squadron aircraft by their assigned pilots, Whittier recalled that until late 1941 his assigned craft, BuNo 2106, may have had the lettering AENS. WHITTIER≅ and the excellence in bombing symbol "E_B" stenciled below the cockpit. Regarding personalized markings, Whittier recalled that:

> Until late '41 planes were assigned to pilots in the squadron organization and bore their name and an "E" for expert, or excellence in bombing, gunnery, etc. as awarded in the annual Individual Battle Practice Trials. Toward the end of 1941 it was settled on - the aircraft color would be all-over non-spectral gray, with no squadron or ship markings, pilot names or any identification which would reveal the strength of Naval Aviation. Later on we put on Japanese flags to denote 'kills' (Letter, CAPT Mark T. Whittier, USN (Ret) to CAPT R.L. Rasmussen USN (Ret), 9 February 1994).

Marks such as national insignia, side codes, and rudder stripes were also subject to frequent alteration and experimentation over the course of the early Pacific War, especially in regard to carrier-based aircraft. The Navy's traditional national aircraft insignia, composed of a blue field, white star, and a red circle in center, was in effect from 19 August 1919 to 6 May 1942 (Elliott 1989, 66-67). A 26 February 1941 directive specified that this insignia should be placed upon the upper left and lower right wing surfaces, and on both sides of the fuselage (Elliott 1989, 65). On 23 December 1941, an order was issued by CinCPac to mark all aircraft in the Hawaii Operating Area with large insignia on both sides of the fuselage, as well as on both the upper and lower wing tips. Furthermore, thirteen alternating red and white horizontal stripes were painted on aircraft rudders (Elliott 1989, 62, 66).

By January 1942, a number of complaints about friendly-fire episodes led to a directive

to enlarge all national insignias (Stern 1988, 13). This resulted in what is often referred to as the Aoversized≅ national insignia. Another order issued in January of 1942 required that squadron numbers be removed from the side codes of all Navy aircraft (Stern 1988; 13, 25). On 6 May 1942 the Secretary of the Navy directed the removal of the red circle and the red and white rudder stripes so as not to cause confusion with the red *hinomaru* (rising sun) emblems painted on Japanese aircraft. Many carrier pilots felt certain that American anti-aircraft gunners would loose their fire at anything painted red, presenting an aircrew morale problem (Stern 1988, 14; Elliott 1989, 66-67). On *Enterprise*, the red markings were actually dropped before the order to do so was officially handed down. Dated photographs indicate that some red markings were painted out by 15 May 1942, although the order was officially given on 20 May (Stern 1988, 14). The white star in blue field national insignia design was in effect from 6 May 1942 to 28 June 1943 (Elliott 1989, 67).

In regard to the side code, national insignia, and rudder stripe specification as they were applied to BuNo 2106, this aircraft indeed displayed evidence of having been affected by some of these directives. During the spring of 1942, when *Lexington* aircraft saw the addition of thirteen alternating red and white rudder stripes and red-centered star insignias in all six positions (Stern 1988, 25), BuNo 2106 complied with this format, as evidenced by the markings visible in the three 7 June 1942 photographs. The paint coating patterns and markings BuNo 2106 displayed upon recovery seem to indicate that it was onboard *Lexington* long enough to go from the overall light gray to the blue gray over light gray color scheme, to have its air group number removed from the side code, and to have its red national insignia markings painted out.

Upon arriving at Midway, 2106 was apparently not repainted to any local specifications, but was left with the original Navy camouflage pattern. A number of factors may have made the exterior appearance of the aircraft a low priority, including the facts that the craft was operating from an ill-supplied island as part of a hastily-assembled composite unit, and had recently arrived following a rushed shipping

In *A Glorious Page in Our History*, Cressman offers an insightful analysis of the three photographs of BuNo 2106 taken on 7 July 1942. In these photographs are several details. The number A6≅ is painted on the fuselage, in agreement with surviving VMSB-241 squadron records that indicate Iverson=s place in the squadron organization as flying 241-VMSB-6 (VMSB-241 War Diary, 1-31 May 1942; VMSB-241 War Diary, 1-30 June 1942; AReport of the Battle of Midway Islands,≅ CO, MAG-22 to CinCPac, 7 June 1942; AReport of Activities of VMSB-241 during June 4 and June 5 1942,≅ CO, VMSB-241 to CO, MAG-22, 12 June 1942). A painted-out area is visible next to the plane number where the mission letter should be. Cressman points out that the obscured character was probably the letter AB≅ since the plane had formerly been operated by VB-2. Alternately, it could represent renumbering following the loss of one of VMSB-241's 19 original SBD-2s.

From this evidence some aspects of the craft=s appearance during its later time with VB-2 may be reconstructed. Also evident in the photographs is the fact that the red center of the national insignia, and the red and white rudder stripes had been recently painted over with less prominent colors. However, the overpainting did not fully obscure the original markings, and

evidence of them is barely visible beneath the newer paint (Cressman et al 1992, 80). Thus, the only aircraft paint alteration known to have taken place on Midway was to the side code applications. It is unknown if the Marines painted the new ship number on the cowling or center panel leading edges, because the photographs of BuNo 2106 were taken from astern the craft, and do not show a forward profile.

Evidence of Paint Coating and Marking Pattern Alterations at NAS Glenview (1942-1943)

The side code and ship number stencils, still visible on BuNo 2106, are both alterations that likely occurred following BuNo 2106's arrival from the San Diego overhaul facility. Because the exterior patches were painted in the same two-color camouflage scheme as the aircraft, it seems that 2106 was at least touched up, and possibly substantially recoated, in the same pattern of its already extant paint coating. Although the question of whether this was done at San Diego or Glenview must go unanswered. BuNo 2106 became B-7 in Glenview's flight organization.

One particular directive was issued which, in theory, should have affected the appearance of BuNo 2106 during the time it spent at Glenview. This was Directive SR-2C, ASpecification for Exterior Colors, Insignia, and Marking of Naval Aircraft,≅ issued on 5 January 1943. SR-2C directed that all naval aircraft be painted in a new three-color camouflage scheme (Elliott 1989, 34-35). Interestingly, there is no evidence that BuNo 2106's out-of-date two color scheme was replaced with the three color scheme according to the 5 January 1943 directive. This suggests that the repainting of at least some of the craft assigned to such training billets was given a low

priority. This is understandable when considering the substantial attrition rate among Glenview CQTU aircraft.

Finally, sometime between the aircraft's arrival on Midway Island and its loss, the name *Midway Madness* was given to the craft. It was evidently applied with a small brush using black paint, and was written using all capitals. It is unknown when this name was conferred upon the craft, or by whom.

As a general rule when dealing with any Navy aircraft, it should be remembered that due to the great deal of effort being concentrated upon Navy operations over the course of the early Pacific War, there were numerous exceptions to these various directives, and a number of inconsistencies can be seen in dated photographs (Stern 1988; 12-13, 25). In his study of naval aircraft markings over the period of 1940-1949, Elliott makes an excellent point concerning the difficulties of consistency, which should be kept in mind during the study of any Second World War-era aircraft:

> At no time were there as many changes issued for painting of aircraft as there were during the ten years covered in this volume [1940-1949]. However, it must be remembered that these changes were what was desired and that there were many aircraft which were not repainted for a variety of reasons. The press of combat requirements, of course, took precedence over such a mundane task as painting. In most cases the carrier squadrons and those deployed in the combat area did not have the equipment to conduct an extensive repainting project. It was all they could do to patch up battle damage. Consequently, most of these changes were done by the manufacturers, or by Overhaul and Repair facilities within the U.S., while the aircraft in the field remained in the same scheme in which they had originally been issued. Replacement aircraft, especially overseas, were drawn from a pool and frequently retained the pool accountability number rather than having a new one applied to conform to squadron systems. This resulted in some strange schemes within a unit. However, they flew just as well and performed their missions as well as factory-fresh aircraft (Elliott 1989, 12).

It is important to remember that researchers should not rely on paint schemes to identify an aircraft. Studies of aircraft like this one, can provide evidence of small deviations from the

accepted standard, and can display a part of history not available from manuals and history books. It is these deviations which make field-work with historic aircraft vital. Other than the comparatively rare recollections of war-time aviators, these elements of history would go unrecorded if not for studies such as this one.

Evidence of Post-depositional Structural Erosion to the Aircraft Materials

The concept of galvanic reaction between dissimilar metals, wherein a weaker metal acts as a sacrificial anode for a stronger metal, is commonly encountered in dealing with the problem of metal corrosion. Immersion in water speeds this reaction. In BuNo 2106's construction, metal deterioration was evident and focused in a substantial number of small areas on the aircraft's structure. The elevator rib, rudder ribs, and vertical fin leading edge fairing have already been noted as highly corroded.

The wheel rims of the main landing gear were unusually corroded (Figure 8). The main wheel rims were largely missing, and the tires were absent, due to the almost complete corrosion of the magnesium alloy rims. When compared with the slower rate of corrosion seen in the rest of the aircraft structures, these differential corrosion rates indicate that a magnesium alloy, of which the wheels were formed, has a greater tendency to erode over time in water when in the company of more dominant metals. This corrosion process may have been encouraged by the close proximity of nobler stainless steel and aluminum alloy structures, which could have caused the magnesium structures to act as sacrificial anodes.

A buildup of ferrous corrosion residue was found on all three of the machine guns

(Figures 17, 28). Evidence of corrosion was also present around the hinges to the missing gun well doors and the parachute flare tube turtleneck access door (Figure 55). There appeared to be a slightly greater degree of corrosion or marine growth on what were the exposed portions of the craft during its submergence. These areas included the uppermost component of the vertical fin, which constituted the highest point of the wreck (Figure 324).

The fabric-covered control surfaces displayed evidence of deterioration. Although some doped fabric did remain on the elevators (Figure 6), no fabric remained on the rudder frame (Figure 8). Surviving fabric surfaces were not analyzed for doping codes, as most had been removed by the time of our arrival.

The generally good preservation evident on BuNo 2106 is not unusual since the condition of other Navy aircraft recovered from Lake Michigan exhibited similar qualities. This includes such finds as compressed air still present in inflated tires. This was in cases where the wheels are not magnesium. And some exhibited still-intact radio vacuum tubes. It has been reported that on one occasion during NMNA recovery operations, it became necessary to use gasoline from a recovered aircraft to fuel a boat=s outboard motor (Personal Communication, Les Schnyder to Rich Wills, 1995).

Conclusions Drawn from the Historical and Structural Analyses

The identity of BuNo 2106 has been confirmed through several evidence categories, including the presence of its individual serial number, general paint layering characteristics, and damage that is consistent in character with historic descriptions. Based upon the historical record

and the detailed archaeological observations made in the previous sections, it is possible to draw some general conclusions concerning the operational history of this aircraft.

The attitude of the aircraft at time of loss indicates that the controls were oriented as if in preparation for trapping on board a carrier. The arresting hook, flaps, and landing gear were all down. The pilot=s hood was backed into the open position. The cowl flaps were cracked partly open, indicative of a need to cool an engine running at high power, but at a minimum airspeed. There was some rudder and tab applied to starboard, and the elevators were slightly elevated, although whether these features are the result of intentional control settings or post-depositional processes remains unknown. All evidence indicates that BuNo 2106 was coming down fully "dirty," in the pilot's slang of the period, for a trap onboard *Sable*.

A substantial amount of evidence indicated damage, modification, and material replacement during the short, but harsh operational lifetime of this aircraft. The nature of the aircraft=s repair reflects economy, and suggests that existing materials were reutilized to a significant extent. Historical evidence points to at least two major maintenance repairs in addition to the average expected line preventative maintenance schedule (PMS). One of these maintenance activities took place at NAS Ford Island in 1941 following the Lake Charles maneuvers, and the other occurred at NAS San Diego in 1942 following the Battle of Midway.

In terms of structural damage, the extensive nature of the damage present within the airframe structures is generally comparable with the descriptions in historical documents of the ferocity of the attacks suffered by BuNo 2106. The extant physical repairs within the aircraft=s construction correspond closely with historical photographic documentation of the extensive projectile and ground impact damage visible in the aircraft. Other possible combat-related

damage that may have been sustained during the aircraft=s economic life could be the damage to the undercarriage, left wing, and propeller due to having been forced to land on only one main wheel instead of two because of a bullet lodged in a main landing gear locking mechanism (Moore 1943, 77-78). The ground impact damage to the aircraft's port wing that is evident in the photographs taken three days after its participation in the Midway action may have led to the installation of new or extensively reconstructed outer wing panels, although this has not been confirmed.

The power plant mounted in the aircraft at the time of its loss was not the craft=s original factory installed engine. Whittier indicates that BuNo 2106 underwent an engine change due to the foreign matter ingestion experienced during the 1941 Lake Charles war games (Whittier 1992, 31-32), and this is supported by the aircraft=s history card. It is conceivable that BuNo 2106 may have had more than one powerplant change, considering the nature of engine maintenance and the eventful operating life of this particular aircraft. Another such engine replacement was likely performed at San Diego in the fall of 1942, although this is conjecture. The strangely rigged safety wire on the engine crankcase bolts may indicate that the aircraft served as a training platform not only for pilots but also to some extent for mechanics and ground crew as well.

When the SBD-2 model first arrived into the fleet, it did not come equipped with self-sealing fuel tanks. The *Lexington* VS-2 Dauntless (2-S-8) seen afire and crashing during the Lae-Salamaua Raid probably lacked this critical protective feature; certainly the ill-fated Douglas TBD-1 Devastators did at Midway (Message, Commander, Task Group 11.5 to Commander, Task Force 11, AReport of Bombing Attack on Enemy Shipping in Salamaua-Lae Area, 10

March 1942,≅ 4-5). The Navy began conducting research into self-sealing gasoline tanks as early as 1939, what developed was a rubber cell housed in an aluminum shell. Initially, the rubber used to construct the tanks came from Malaya, but following the fall of that region to the Japanese in early 1942, the major source for such material became reclaimed rubber collected in scrap material drives (Eckelmeyer, Jr. 1946). The SBD-3 was the first Dauntless model in which the self-sealing tank liners were factory-installed (Francillon 1988, 257). Fuel tank liners were apparently installed into BuNo 2106, suggesting that this feature was retrofitted in at least some of the surviving earlier model Dauntlesses. It has been reported that some SBD-2s were later retrofitted with self-sealing tanks, which had the side-effect of reducing total fuel capacity to 260 gallons (Francillon 1988, 256). Maintenance data stenciled on BuNo 2106's fuel-tank liners indicates that the liners were changed as early as 30 June 1942, with further maintenance on 15 December 1942. Questions that remain include: When were these first installed into the -2s? Did this feature help the aircraft survive the punishment it sustained at Midway? Was this done as a standard upgrade with all SBD-2s, or was it dictated by necessity in the case of this particular aircraft, because that was all that was available after both of 2106's inboard tanks, and probably the outboard tanks were holed? Does it reflect a standard level of premeditated parts interchangeability? Future analysis of other SBD-2s from Lake Michigan may provide an answer, as these aircraft may be able to provide a more representative cross-section of the SBD-2 population.

The SBD-2 noticeably lacked the range of the later Dauntless models. To compensate for the -2's inferior fuel capacity, it was often the custom to remove one of the two fixed .50 caliber Brownings on long-distance flights as a weight saving measure (Francillon 1988, 256). The

additions of protective armor, the fuel protection system, and the additional Browning and its ammunition, all ultimately resulted in an increase in gross aircraft weight. To compensate for this weight increase, Douglas began providing these modifications on the factory floor, and beginning with the -3 production sequence, built airframes with Alclad instead of the more weighty duralumin (or dural).

BuNo 2106 possessed a hard rubber tail wheel at the time of its loss. No tail wheel fairing was present on the assembly at the time of the recovery. Based upon available supporting historical evidence, it is possible that the tail wheel fairing may have been removed as the result of an earlier, pre-crash action. It has been noted that the tail wheel fairing was not only removed on many land-based Dauntlesses, but also on some carrier-based aircraft (Stern 1988, 40). Whittier indicates that the aircraft had its tail wheel changed from a hard rubber wheel to a pneumatic wheel in order to accommodate the aircraft for the muddy conditions of the 1941 Lake Charles war games, after which it was changed back to the carrier-deck configuration (Whittier 1992, 53-54). However, at the time BuNo 2106 was photographed at Midway on 7 June 1942, a tail wheel fairing was present on the aircraft. Therefore, while it should not be assumed that the craft possessed its tail wheel fairing at the time of its loss, this possibility should not be ruled out.

Just as interesting as what was modified, is what was not. A single .30 caliber Browning gun still resided in the flexible gun position, the mount not having been modified to present twin .30s, as was done on many other earlier Dauntlesses. In the early phase of Pacific combat, individual fleet carrier-based squadrons quickly learned that they needed to modify their aircraft through improvisation to meet the immediate demands they faced. Onboard *Hornet*, squadron

personnel of VT-8 modified their Devastators through adding armored seats, improving their survival kits, and fitting another .30 machine gun in the rear flexible mount to provide a more adequate defense for the slow, old, and highly vulnerable TBDs (Gay 1980, 122). *Yorktown*=s VF-42 removed the unaerodynamic bomb racks from their Wildcats, installed self-sealing fuel tanks, and welded boilerplate into the airframe to provide armor protection for the pilot (Lundstrom 1984, 67-68). To be more realistically prepared for the harsh environments in which they were operating, individual VF-42 pilots also improved their survival kits with whatever they could scrounge up, including meat cleavers from their ship=s wardroom pantry (Cressman 1985, 67). Onboard *Lexington*, VB-2 modified their Dauntlesses by adding armored seats and bulletproof windscreens. The historical record indicates that BuNo 2106 underwent a field installation of a Aheavy armor seat," replacing the lighter aluminum one for the pilot, and Athick, bulletproof windshield glass≅ in preparation for war (Whittier 1992, 56). Although the windscreen was broken out of the aircraft at the time of its recovery, the armor seat was still in evidence, which is consistent with what is indicated by Whittier. The telescopic bombsight was also still present, indicating that it had not been replaced with a newer, more “user-friendly” reflective sight. Early wartime dive bombing experiences revealed that a serious problem existed in the form of fogging windshields and sights during dives, which adversely affected aim. At the 20,000 feet pushover point, the aircraft flew through a colder air layer, but once entering into a dive and plummeting seaward, the aircraft hit layers of warmer, moister air that caused the windshield and telescopic sight to fog up. This usually became severe at an altitude of about 8,000 feet. In some cases pilots had to complete their dives by sticking their heads out over the side of the cockpit and estimating their bomb=s trajectory by eye (Cressman 1988, 58, 81).

Evidently this problem was not solved in the case of BuNo 2106. An emergency survival kit stocked with the minimal required tools was also found on board BuNo 2106 that had probably never been used. As expected, no parachute flares were onboard due to the dangers of accidental fire associated with them at that time. Only one float light was present, indicating that at the time of the aircraft=s loss, missions requiring such items were unlikely.

It was possible to distinguish damage from the crash that claimed the aircraft, previously repaired damage consistent with historical accounts, and post-depositional processes experienced by the aircraft such as a gradual increase in material corrosion levels. Nearly all the unrepaired damage observed during the study resulted from the accident that finally claimed the aircraft. The airscrew had minimal deformity in all three blades, suggesting that the engine was not under power at the time the prop came into contact with the water although the prop spinner showed considerable evidence of impact-related deformity. The outboard portion of one wing was torn off where it caught the water, the undersides of both wings were dished in from the rest of the aircraft hitting the surface, the engine mount was sprung, portions of the spent ammunition casing jettison chutes running down the firewall were crushed, and certain cowling panels were deformed or missing. In general, this aircraft does not display any of the more severe wrecking patterns observed in other naval aircraft recovered from Lake Michigan (Figures 400-426), suggesting a relatively gentle impact with the water=s surface. The airplane's distinct paint layers and marking patterns reflect the Navy's transition from bright peacetime colors to combat camouflage. BuNo 2106 provides an individual reflection of this transitional period through its layering of factory-applied bright peacetime fleet colors, overlaid with the subsequently-ordered overall light gray, which was in turn overlaid with the blue gray over light gray. Additionally,

the fact that no evidence exists to indicate that the paint pattern was brought up to date with the new three-tone pattern ordered by Directive SR-2C, reveals that such alterations probably received a low priority where training command aircraft was concerned. These same transitions are also evident in the size, style, and placement of the aircraft=s visual identification marking codes such as its BuNo, side code, and national insignia. BuNo 2106's side code changed with its unit assignment and the aircraft's place within that unit's organization, from 2-B-2, to (241-MSB-) 6, and finally to B-7 in NAS Glenview=s CarQual unit. BuNo 2106 also managed to acquire the name, *Midway Madness*, in a military system that did not always encourage such individualistic practices.

BuNo 2106's economic lifespan typifies the average operational service life expected of most fleet aircraft in operation at that time. This can be compared within the context of the overall attrition rates experienced during squadron training and predeployment workups, daily fleet operations, and combat. As a new aircraft, BuNo 2106 reflected state-of-the-art dive bombing technology and represented years of research, proposals, development, and evaluation. In the scramble to equip an ill-prepared Pacific Fleet to meet the coming war, intensive training was conducted. Aircraft were hurriedly repainted, some with emphasis on meeting the immediate need for effective camouflage while at the same time presenting adequately visible insignias to prevent friendly-fire incidents. There was little emphasis on aesthetics.

The first year of the war claimed many of the Pacific Fleet=s first line ships and aircraft, while the Navy was urgently awaiting material reinforcements. These supplies also had to be shared with the Marine Corps and the stateside training commands. In a dynamic combat environment that demanded constant technology and strategy upgrades, high demands were

placed on equipment. In the early days of the war, while waiting for American aircraft production to catch up with the demands of the military, many of the fleet aircraft in service were taxed far beyond their recommended endurance. Engines were expended before their time, and modifications to the airframe were made where necessary. Large amounts of flight time, overspeeded engines, and stressed, bent, and holed airframes all contributed to a substantial attrition rate. As the vessels like *Lexington*, *Yorktown*, *Hornet*, *Wasp*, *Saratoga*, and *Enterprise* held the line to the last, and expended their aircraft under the punishment of the enemy fleets, the aircraft that survived were subjected to increased use and even greater levels of stress. In a short time, the relative usefulness of the SBD-2 as a first line aircraft came to an end, and it began to be phased out and replaced by the next newest model slowly making its way to the fleet. The older survivors were then relegated to second line outfits in dire need of suitable aircraft. In its second incarnation, BuNo 2106 performed its service with the U.S. Marine Corps honorably despite a number of shortcomings, absorbed a great amount of punishment, and then was again returned to the fleet pool for recycling. By this point, the majority of its model had been destroyed, lost, or surveyed as the result of combat, material failure, or accidents during their operational employment. Thus, BuNo 2106 could be viewed by this time as having already been spared beyond its average expected life span. Having survived both foreseen and unforeseen circumstances, it was given a major overhaul, which probably did not take place immediately due to receiving a low priority status because of extensive damage. During this overhaul, an attempt was made to get the maximum reuse out of the aircraft=s materials, in which repair was stressed over replacement of damaged components where possible. Perhaps this was due to the shortage of materials during early wartime. Perhaps no unusual efforts were wasted on an aircraft

destined to finish out its career as a training craft, during which time it would more likely than not come to grief anyway. BuNo 2106 eventually was provided to a training command for use in instructing students, constituting a forgiving mount which was perhaps, as naval aviator George Gay relates in his memoirs, like the ones he trained in and described as follows:

> These old relics had all been in the fleet and it was not unusual to come down and be able to write your name in oil on the side of your plane (Gay 1980, 43).

After arriving at NAS Glenview, no effort was made to repaint it in compliance with the new regulations recently put into effect by BuAer. It is likely that more important things needed to be addressed than the color of an aircraft which had already seen its days of combat. While at Glenview, it may not only have provided a forgiving platform for the abuse of aviation cadets learning how to perform what basically comprised controlled stalls and crash landings aboard a hastily-improvised and ill-suited training vessel with little freeboard, but also a sturdy craft upon which the ground maintenance crews could practice their trades. Perhaps due to the demand for high-grade aviation fuel in the forward combat areas, the aircraft at Glenview may have used a lesser quality fuel for their short hops. Whatever the reason for its loss, when the end came, *Midway Madness* allowed its pilot to escape before it filled with the water it had so often flown over, and sank beneath the surface still frozen in its last attitude: hood back, flaps down, wheels out, cowl flaps cracked, and tailhook out.

It is revealing to consider the aircraft=s life span in relation to others of its model. Many other survivors ended their careers as tugs, hacks, and training platforms before being stricken from the operational inventory. Some of the survivors ended up on the bottom of Lake Michigan, strewn alongside the surviving SB2Us, TBFs, and F4Fs of other equally hazardous branches of

the military. Even in its afterlife BuNo 2106 is still performing a service for the Navy, serving to memorialize the persons who built, crewed, and maintained such craft during an unprecedented era of international turmoil.

The nature of this aircraft=s loss also reflects the importance placed upon the need to rapidly qualify pilots, and its use in this way is indicative of the manner in which naval aviators were trained. The circumstances under which the aircraft was lost are revealing. The converted Great Lakes liners *Sable* and *Wolverine*, the ersatz wooden carrier deck structures complete with catapults and arresting gear that were used at a number of naval air stations, and the emphasis of training on field carrier landing practice (FCLP), all demonstrate the high priority in training and the shortage of real decks to dedicate to such training during the early part of the war when America was trying to augment its carrier strength. Advanced training in the U.S. Navy was different than in the Imperial Japanese Navy. American pilot training stressed advanced carrier squadron tactics and doctrine, and group training and workups as part of an intermediate Aaircrew pipeline≅ into which crews could move as a unit and be drawn from upon demand to replenish front-line units in need. At the outset of the war, the U.S. Navy=s carrier air groups and squadrons possessed some degree of autonomy, but were still nominally attached to a single carrier and usually possessed that ship name as part of their air group designation. As the war progressed, these air groups gained a higher level of autonomy to the point where they could be rotated between ship and shore stations, or from ship to ship, based upon the needs of the fleet. These carrier groups ultimately became fully autonomous units, which were often assigned their own numbers having no relation to individual vessels.

Perhaps most revealing is that BuNo 2106 demonstrates the U.S. Navy=s placement of a

high value on the survivability of both individual aircrew and aircraft. What most American aircraft lacked in performance was usually offset by their protective systems and high thresholds of survivability. This is demonstrated by their utilization of armor for crew protection, sufficient fuel system protection, overall structural safety, and the fact that they were adequately gunned. This is opposed to the Japanese Imperial Navy, in which self-sealing tanks and armor were often sacrificed to provide lighter and more maneuverable aircraft with a greater range and firepower, often at a considerably great expense to aircrew safety.

The modifications that were made in this Dauntless reflect an effort to bring an older model aircraft up to the most recent standards, the interchangeability between similar models designed into the aircraft type, and represent the high priority placed on the concepts of crew protection and aircraft survivability by BuAer. The high priority the U.S. Navy placed on individual aircrew and their maximum protection may have been one of the significant factors that ultimately contributed to America gaining naval air superiority in the Pacific War and achieving final victory in the Second World War.

6. Conclusion: Recommendations for Preservation and Future Research

Management Authority over BuNo 2106

The oversight and supervision of sunken U.S. naval watercraft and aircraft wreck sites falls under the jurisdiction of the Naval Historical Center. It is the Navy=s policy to retain custody of all its aircraft that have been lost to forces other than those constituting formal, premeditated, and legal acts of abandonment. These losses can result from combat or non-combat related operations. This policy encompasses not only aircraft, which today may be historic, but also lost aircraft that may remain listed, along with their crews, as unaccounted-for in Navy records. As part of its unique custodial responsibilities, the Navy encourages the following: preservation of its historic cultural resources; the prevention of lost military weapons systems from being recovered and used for illicit or unsupervised purposes; the protection of the public from potentially unexploded ordnance that might be present on such a site; the respectful treatment of human remains from those sites constituting war graves; and the fullest possible accounting of missing or unidentified Department of Navy aircraft and aircrews.

Currently there are more than 15 federal laws and regulations relating to the Navy's custodial responsibilities in regard to submerged aircraft and shipwrecks. The Department of Defense Legacy Resource Management Program has been instrumental in supporting the treatment of the Navy's historical resources. The Department of the Navy/Naval Historical

Center has published guidelines entitled, *Policy Fact Sheet: Sunken Naval Vessels & Naval Aircraft Wreck Sites* that states their policy regarding the custody and management of ship and aircraft wrecks.

Cooper (1994) suggests that obstacles to responsible management of historic aircraft resources may include the existence of a large commercial market for historic aircraft and components, the recent warbird movement, and theft. Concerning the role of the air museum in aviation cultural resource management, Cooper makes the statement that:

> Some aviation museums have exacerbated the problem by undertaking large salvage operations of submerged historic aircraft for restoration or trade with other museums. Bereft of archaeological mitigation or cultural resource management considerations, these salvage operations have helped legitimize and encourage aircraft salvage operators, fostering a public salvage mentality regarding historic aircraft wrecks. This has also created a high cash value for historic aircraft search and salvage services, as well as the aircraft themselves, a value which directly translates into illegal salvage operations and sales. Only by working with trustworthy recovery operators, under the direct supervision of archaeological professionals, will the aviation museum community be able to demonstrate to the public the difference between scientific study and (if appropriate) recovery of historic aircraft versus the piratical activities of salvors and black market collectors.
>
> Unfortunately, the current situation with historic aircraft is somewhat analogous to the problems this country has had in protecting its Spanish colonial shipwrecks. The cash values of the resources, whether real or perceived, have prompted a runaway cottage industry of salvors, investors, aviation buffs, and museums all scrambling to make money, to gain a treasured item for display, or (in the case of some aircraft buffs) for actual use (Cooper 1994, 135-136).

Cooper's prediction of an emerging new cottage market for aircraft salvors has recently been exemplified by the advertising of the JW Fishers Manufacturing Company Inc. (1994), a commercial business that has recently publicized their ability to locate submerged Navy aircraft with remote sensing equipment.

One of the largest aviation museums undertaking aircraft salvage operations on an extensive basis is the National Museum of Naval Aviation. NMNA currently uses a section of the U.S. Code (10 USC 2572) to legitimize their recovery and trading activities with military agencies and other museums and organizations. The International Group for Historic Aircraft

Recovery (TIGHAR) has acknowledged some of the dilemmas facing NMNA and explores some of them in a critical but insightful editorial entitled AProblems and Progress in Pensacola≅ (TIGHAR 1993, 14), which in part states:

> The National Museum of Naval Aviation in Pensacola, Florida presents a classic illustration of the changes and challenges facing today's air museums. Like all museums, aviation or otherwise, it is torn between the duty to conserve the artifacts in its collection and the need to employ those same artifacts to advance its own agenda - in this case the memorializing of U.S. naval aviation. And, like most museums, it must dance upon the horns of this preservation-versus-interpretation dilemma with inadequate staffing, funding, and education... (TIGHAR 1993, 14).

Material Conservation and Preservation

A number of components that were found to be missing following 2106's recovery are being replaced with parts from other aircraft roughly contemporaneous with BuNo 2106. A few highly eroded parts are simply being refabricated from new materials by NMNA craftsman.

Absent parts that will most likely be replaced with similar components from other aircraft include the outer cowling ring, the original will be saved and stored, and possibly displayed with the aircraft, the missing inner cowl ring/engine compartment panel elements, the port side forward gun bay door, the aft gun well doors, the upper fuselage parachute tube access door, the bomb crutch, some cockpit instruments, and the pilot=s control stick (Figure 173). A tail wheel fairing may also be installed. The wheels will be replaced as well, due to the corrosion suffered by the original assemblies.

Some parts have been completely refabricated based upon the design of the missing original components. These items include the vertical fin leading edge foot fairing element, the vertical fin tip, the unusually deteriorated elevator rib, at least one and possibly two unusually

deteriorated rudder ribs, and the trim tabs on the rudder and at least one of the elevators. Furthermore, an entire new canopy assembly has been crafted by a contracted private restoration facility.

In terms of the aircraft=s original paint coatings, BuNo 2106 was subjected to paint and primer stripping following recovery. Four partially stripped areas which reveal original paint evidence on the exterior airframe were deemed to be unusually significant by the NMNA, and were left in place (see Figures 44-46). The museum plans to paint over these areas with a clear protective coating. The original type of priming agent (zinc chromate) was not reused for environmental reasons. Exactly what overall paint scheme the aircraft will be recoated in is unknown as of yet, but it will probably be configured to appear as it did at the time of the Battle of Midway.

The loss of some historical material is often unavoidable in any dealing with such a complex item, and substitution for missing parts which are simply not present is logical, providing such a substitution is documented. However, in the cases of some surviving but damaged or eroded structures, careful consideration should be given regarding exactly which components should be replaced, and which should be retained and conserved. The pilot=s control stick, as an integral element of the aircraft structure symbolizing the interaction between 2106 and its pilots, is a case in point. The original control stick was and still is easily capable of being conserved and reinstalled in its original orientation. However, it is instead being replaced outright with the stick from another aircraft. If substitutions such as this one constitute a permanent arrangement, such actions may have the ultimate effect of causing the historical integrity of the aircraft to be diminished. One policy change undertaken by the NMNA

approximately two weeks before our scheduled arrival was the implementation of a new system intended to catalog, on maintenance work order forms, component alterations to the aircraft as the preservation process proceeds.

An aircraft can pose as one of the most difficult composite artifact scenarios for the archaeological material conservator, especially when recovery from an underwater environment is considered. To adequately appreciate the complexity that may be encountered in creating a conservation strategy for such a composite artifact, it is necessary for the conservator to develop an appreciation for the fundamental material composition of the aircraft and its components. An aircraft's conservation needs cannot be fully understood, nor can a proper conservation strategy be adequately developed, without an understanding of the basic material compositions and treatments present within the artifact.

This aircraft posed something of a dilemma for NMNA and the NHC in terms of how to responsibly conserve, study, and maintain its preservation over the long term. Up until this point, the museum had practiced a curatorial philosophy in which the concept of "rehabilitation," termed as "restoration" by the NMNA, was stressed over the philosophies of Aconservation≅ and Apreservation.≅ NMNA showed foresight in recognizing that its traditional operating procedures, similar to those used by many other air museums and preservation groups, may require reevaluation.

In addition to the original manuals relating to the specific type and model of the aircraft in question, it is helpful to utilize some of the very basic technical literature contemporary to the aircraft's manufacture and economic life span. In the case of BuNo 2106, useful and explanatory texts contemporary with the aircraft include the following: Faulconer's *Introduction to Aircraft*

Design (1942); Langley's *Metal Aircraft Construction* (1942); Sears's *The Airplane and Its Components* (1942); Bartholomew's *Aircraft Inspection Methods* (1940); Norcross and Quinn's *The Aviation Mechanic* (1941) and *How to do Aircraft Sheet Metal Work* (1942); and Drake's *Aircraft Welding* (1947) and *Aircraft Electrical Systems, Hydraulic Systems, and Instruments* (1949). Basic handbooks also exist that list in detail common aircraft fittings and fasteners, manufacturer data, and military standards. Two of these are Dzik's *Aircraft Hardware Standards Manual and Engineering Reference* (1971), and Reithmaier, Leavell, and Bungay's *Standard Aircraft Handbook* (1991).

It is necessary for aeronautical archaeological conservators to arrive at a better level of understanding in two areas: One is the differences in how salt water and fresh water environments affect aircraft components, the degree of this difference, and what treatments are required in response to each of these very different environments; The other area is that of the conservation of modern materials, in which much work is yet required in terms of archaeological conservation research.

The conservation of modern materials constitutes an emerging field in archaeological conservation studies which is benefiting from some of the work currently being conducted on historic aircraft structures (most notably in museum conservation laboratories in Australia and France). Paints and primers pose a problem, as do the non-metallic materials (textile, rubber, Plexiglas and Lucite, Bakelite, Phenolite) commonly found in aircraft of this era. Also requiring discussion are the metals, metal alloys, and metal finishes, which include the stainless steels and their alloys, aluminum and its alloys and trademarked derivatives, magnesium and its alloys, and metal surface treatments and composition-altering treatments. In the case of SBDs specifically,

we know that a switch from duralumin to Alclad skin panels occurred between the production of the -2 and -3 models. Aluminum must be treated as a special problem, with separate methods of required treatment that depend upon whether the artifacts in question have been recovered from fresh or salt water.

A substantial amount of pioneering research has been conducted over the last 30 years in the development of modern archaeological. An excellent general archaeological conservation text is Cronyn and Robinson's *The Elements of Archaeological Conservation* (1990). Pearson's *Conservation of Marine Archaeological Objects* (1987) provides insight into the proper care for artifacts recovered from maritime environments, as do Hamilton's *Conservation of Metal Objects from Underwater Sites: A Study in Methods* (1976), and *Basic Methods of Conserving Underwater Archaeological Material Culture* (1996). Singley's *The Conservation of Archaeological Artifacts from Freshwater Environments* (1988) is especially applicable to all Lake Michigan aircraft in that much of her research focuses on artifacts recovered from Lake Michigan. Spenneman and Look's evaluation (1993) of metal conservation techniques used in preserving weathered Second World War artifacts in the Marshall Islands is also quite specialized in terms of the era on which it concentrates, and it could be useful to aircraft studies.

A good deal of metallurgical literature is available on the subject of aluminum and aluminum alloy corrosion. Dix, Brown, and Binger's *The Resistance of Aluminum Alloys to Corrosion, Vol. I, Metals Handbook* (1975) is a standard text in metal corrosion studies. Also available are Johnson's *British Corrosion Journal* article entitled ARecent Developments in Pitting Corrosion of Aluminum≅ (1971), and an *Australian Journal of Chemistry* series on aluminum corrosion studies researched by Lowson (1974, 1978) and by Berzins, Lowson, and

Miram (1977).

A considerable amount of groundbreaking research targeting the best techniques for the conservation of aircraft aluminums and aluminum alloys has in fact been carried out in Australia and France (*TIGHAR Tracks* 8.4, 1992). Foremost among the practitioners in this area are Dr. Ian MacLeod of the Western Australian Museum in Fremantle, Dr. Christian Degrigny of the laboratory *Valectra d'Electricitè de France*, and conservation scientists David Hallam and Christopher Adams of the Australian War Memorial (AWM) in Canberra. The early experiments conducted by MacLeod (1983) in aluminum consolidation and copper passivation at the Fremantle Museum's Conservation Laboratory were groundbreaking. The body of literature on the subject of chemical neutralization and electrolytic reduction of marine-recovered aluminums was substantially increased by Degrigny (1990, 1991, 1992, 1993), who was also working in cooperation with the AWM. Hallam and Adams's AFinishes on Aluminum: A Conservation Perspective≅ (1993) provides a further invaluable contribution when the variability and problems of surface treatment are considered. Adams (1993) and Degrigny (1995) have further gone on to study the conservation requirements and complexities of aircraft powerplants recovered from underwater environments. One particularly interesting aircraft case study that may parallel that of BuNo 2106 is the Loch Ness Wellington (Flower 1995, 42-47), as it was also recovered from an inland fresh-water environment.

Bluntly, the way in which an aircraft is conserved is ruled by the preservation philosophy of those who have stewardship over it. A debate over this practice has been initiated, and to be understood, one must see the difficulties that have been experienced by archaeologists and museums attempting to work together. A successful dialogue cannot occur unless both parties

understand the differences in their philosophies. Aspects of aircraft preservation philosophy, practice, and cultural resource management have been explored in Carrell (1990), Foster (1993), Diebold (1993), McManus (1994a, 1994b), Cooper (1994), Gillespie (1994), Schwarz (1995), Whipple (1995), Delgado (1995), Millbrooke (1995), and The International Group for Historic Aircraft Recovery (TIGHAR) (1992, 1993, 1994).

TIGHAR has been a prominent voice in encouraging proper aviation historic preservation practices, and has produced a very simple but useful publication entitled, *Guide to Aviation Historic Preservation Terminology* (1993). One of TIGHAR's primary beliefs is that Athe destruction of historic aircraft occurs most frequently not in airshow crashes but in >restoration shops=≅ (cited in Schwarz 1995, 7). TIGHAR's Richard Gillespie provides an excellent history of the development and evolution of the aviation historic preservation movement in a monograph entitled AAircraft as Artifacts: Historic Aircraft Recovery and the Movement Toward Aviation Historic Preservation≅ (Gillespie 1992). In this insightful commentary he states:

> The natural consequence of such an explosion in demand for airplanes that were, by definition, in limited supply caused a corresponding explosion in prices. Because the new air museums lacked the established infrastructure, and therefore the funding, to compete with private collectors, the best surviving examples were soon in private hands and were either being flown or were undergoing rebuild toward that end. Recoveries of rare aircraft followed the same economic dicta that were carried out, not by historical teams on behalf of museums, but by salvagers seeking to acquire valuable commercial properties. Air museums, rather than being the repositories of the finest historical specimens, were more often left to make do with the aircraft private collectors found uneconomical to make airworthy. The situation was compounded by the fact that the public's expectations concerning what a vintage aircraft should look like were set by what it saw at airshows, in magazines, and on the movie screen. Air museum directors and staffs came, for the most part, from aviation rather than museum backgrounds and, therefore, shared the public's view. This demand for museum aircraft of pristine appearance not only operated against genuine preservation but imposed upon air museums a tremendous financial burden in acquiring and maintaining the facilities, tooling, and personnel to carry out extensive aircraft modification and reconstruction.
>
> Today, we see in the air museum world an almost complete inversion of the historical process. The most basic premise of all historic preservation is the safeguarding of the physical material that has come down to us from the past. Artifacts are valued for the degree to which their original fabric has survived, and the whole art and science of historic preservation has, for three hundred years, had that

> principle at its center. But air museums, as we have seen, are not an outgrowth of that tradition. Consequently, historic aircraft are not so much conserved as artifacts as they are maintained as airplanes. Air museums do not have preservation centers staffed by conservators, but rather Arestoration≅ shops staffed by airplane mechanics. The goal is not to save what is there but to fix it up to look like we wish it once did. The result is that, despite the profusion of air museums, very little aviation historic preservation is going on. What is of greater concern is that the opening up of new areas for historic aircraft recovery (either because of technological advances or political changes) will condemn aircraft that have been slowly succumbing to the Ateeth of time≅ to a more rapid demise at the Ahands of mistaken zeal≅ (Gillespie 1994, 14).

Diebold (1993) reinforces this diagnosis in the below statement:

> ...with all our experience, the preservation community has had very little contact with the aviation community. No official, agreed-upon standards for the evaluation and registration of aircraft exist, not to mention standards for restoration, or even uniform definitions for aircraft preservation terminology (Diebold 1993, 1).

Specifically, this lack of agreed-upon standards has led to an inconsistent application of historical value to aircraft structures. TIGHAR encourages the adaption of a standardized terminology for the air museum world, and differentiates between the concepts of stabilization, conservation, preservation, reconstruction, rehabilitation, and provenience. It has defined these concepts as follows:

> **Conservation** AAll the processes of looking after an object so as to retain its culturally significant qualities, and minimize deterioration.≅ [TIGHAR provides specific definitions for several specific phases of material conservation, as follows:]
>
> > Emergency Conservation: AStabilization of an object in need of specific measures to arrest and prevent rapid deterioration.≅
> >
> > Display Conservation: ATreatment of an object to arrest deterioration, prevent further deterioration, and, at the same time, provide for cosmetic display considerations.≅
> >
> > Preventative Conservation: ALong-term care of an object by measures designed to prevent deterioration and damage.≅
>
> **Preservation** AMaintaining the fabric of an object in its existing state and halting deterioration.≅
>
> **Provenience (also Provenance)** The context in which an artifact is found and recovered. When the artifact is removed from its place of deposition, its provenience can be lost if its context is not properly recorded.

Reconstruction AReturning an object to a known earlier state by means of repair of the existing fabric and, to a substantial degree, its replacement with new materials.≅

Restoration AMeans the same as repair. Returning the existing fabric of an object to a known earlier state with minimal introduction of new material.≅

Stabilization AThe short-term arresting of deterioration pending the implementation of further conservation measures.≅

(All definitions from the *TIGHAR Guide to Aviation Historic Preservation Technology* 1993, 7, 10-11).

TIGHAR further describes the federal publication *Secretary of the Interior's Standards for Historic Vessel Preservation Projects* (U.S. Department of Interior 1990) as Aan outstanding model for what is needed in the aviation world.≅ Gillespie states:

> Vessels and aircraft are two sides of the same preservation coin, presenting many of the same challenges and quandaries for the archaeologist, recoverer, conservator, and restorer. The *Standards* provide, in addition to definitions of basic terms, recommended guidelines for acquisition, protection, stabilization, preservation, rehabilitation, restoration, and interpretation. I would urge any air museum professional to obtain a copy of this publication, read it, and think about how the guidelines it espouses might apply to aviation. (Gillespie 1994, 15).

Recommendations for Future Archaeological Research

Before concluding this report, two questions remain. One essentially asks what can still be done for this particular aircraft regarding potential avenues of further research? The other inquires into what activities have already been undertaken that in hindsight may have been done differently so that future projects may benefit? Museums and agencies considering similar future recovery and preservation activities should keep these issues in mind.

In terms of the material evidence, more research should be conducted on the wing outer panels, which were not present during this analysis. These should specifically be examined for

their individual serial numbers and the relative presence or absence of repaired damage. Also, a more thorough ballistics study of the repaired projectile damage present in the airframe (Figures 397-399) could be conducted to see if any patterns emerge regarding angles of attack and projectile trajectories. For instance, the lack of repaired projectile damage on the underside of craft may suggest either that Japanese fighter pilots favored high overside angles of attack, or that it was an American defensive tactic to get down low on the water to protect the aircraft=s underside and provide a more effective area of defensive coverage for the radioman-gunner.

In regard to as-yet uncovered historical evidence, it seems probable that a more complete survey of such sources could bring to light additional valuable historical resources. This may include primary archival records, the records of individual aviators, and secondary sources. One particular future step might be an examination of the film footage shot by John Ford on Midway Island at the time of the battle there, as it may reveal identifiable evidence of VMSB-241 aircraft and personnel, including BuNo 2106 and its aircrew.

In addition to the formulation of specific research questions relating to this individual aircraft, a broader perspective emerges in regard to the lessons learned in the course of this project. Specifically, the question must be asked, what information may have been lost by not immediately recording diagnostic archaeological data as it came to light? It is probable that some information was lost for lack of an immediate critical structural analysis during and following the recovery, as well as due to the lack of such a study during the early stages of disassembly and restoration. First, the wreck site could have been examined to a more detailed degree. Surveying and mapping of the site appears to have been minimal, although it should be said that the video that was generated proved to be very informative, and provides some mitigation of this fact.

Additionally, the surrounding sediments on the wreck site could have been searched more thoroughly for the potential presence of missing components, such as the tail wheel fairing, the missing engine compartment panels, the rear retractable canopy, the parachute flare compartment upper cover, and the outer wing tip.

Once at Pensacola, the aircraft=s paint was stripped from it for the benefit of a full material treatment of the underlying metal surfaces. During this activity, details may have been encountered such as crew names, unusual markings, cowling colors, and other features that may not have been recognized or otherwise studied. As a result, significant data may have been lost during this activity. Likewise, any potential diagnostic markings such as doping codes present on the fabric of the movable control surfaces may have been lost as well, as this material also had all been removed by the time of our arrival at the facility. Good initial photographic documentation by NMNA mitigated some of these factors, however, especially in regard to revealing some evidence of the aircraft=s previous paint coatings and marking patterns. The museum showed great foresight by conducting good photographic documentation on the occasions of both the recovery and the early disassembly.

It is essential that NMNA take a broader perspective which views BuNo 2106 and the other archaeological NAS Glenview naval aircraft as comprising an interrelated sub-assemblage of craft possessing unique ties to one another. Generally, the Lake Michigan aircraft assemblage should be assessed for what features they have in common with one another, as well as what unique characteristics may be inherent in each. A further analysis of other Lake Michigan aircraft for comparison of wear, damage, and repair patterns, wrecking signatures, and the potential presence of individual aircraft names is suggested. This could encompass aircraft that

have already been recovered as well as those which still remain on the bottom of Lake Michigan. One last issue requiring further thought may be NMNA=s practice of swapping components between recovered Lake Michigan aircraft of similar types and models during their treatment and reassembly, sometimes without sufficient recordkeeping activities. It seems probable that this practice could lead to loss of *provenance* among components, and in the long term will in general eventually detract from the overall material historical integrity of the affected aircraft.

Generally, while some shortcomings are evident regarding the manner in which this particular aircraft was treated, it has undoubtedly been the subject of one of the more thoughtfully executed historic aircraft preservation projects to date. The NMNA went far in its attempts to provide treatment commensurate with the aircraft=s significance, and this philosophy is continuing into the aircraft=s preservation. It provides quite a contrast to the treatment philosophies reflected in some of the museum=s earlier historic aircraft recovery and restoration projects. In their treatment of this wreck, the NMNA has demonstrated that they are slowly moving toward a more responsible perspective of historic aircraft management, at a faster rate than many other aviation museums and restoration facilities. This philosophy is generally reflected in current displays of other Lake Michigan aircraft in the original and largely unaltered condition in which they were recovered, that is, displaying them as what they are, *wrecked* aircraft, and not as restored Aclassic aircraft≅ which, like a collectible automobile, requires a complete refabrication and corresponding alteration in appearance to fulfill images desired as a result of present day values and interpretations. For this, NMNA is to be applauded.

Military Abbreviations

Aircraft Designations

A	Airframe Manufacturer Code Letter Assigned by the Navy to Brewster Aircraft
A-24	Douglas A-24 Banshee Dive Bomber (U.S. Army variant of the SBD)
A-25	Curtiss A-25 Helldiver Dive Bomber (U.S. Army variant of the SB2C)
A6M2	Mitsubishi Type 00 Carrier Fighter (*kansan*) ("Zero")
C	Airframe Manufacturer Code Letter Assigned by the Navy to Curtiss-Wright Aircraft
D	Airframe Manufacturer Code Letter Assigned by the Navy to Douglas Aircraft
D3A1	Aichi Type 99 Carrier Bomber (*kanbaku*) ("Val")
D4Y1	Yokosuka Type 13 Experimental Carrier Bomber (*suisei*) ("Judy")
F	U.S. Navy General Designation for Fighter Aircraft
F	Airframe Manufacturer Code Letter Assigned by the Navy to Grumman Aircraft
F2A	Brewster F2A Buffalo Fighter
F4F	Grumman F4F Wildcat Fighter
F4U	Vought F4U Corsair Fighter
F6F	Grumman F6F Hellcat Fighter
FM	General Motors FM Wildcat Fighter
M	Airframe Manufacturer Code Letter Assigned by the Navy to General Motors Aircraft
P-40	Curtiss P-40 Tomahawk Army Pursuit Fighter

SB U.S. Navy General Designation for Scout Bomber Aircraft

SBD Douglas SBD Dauntless Scout Bomber

SB2C Curtiss SB2C Helldiver Scout Bomber

SB2U Vought SB2U Vindicator Scout Bomber

T U.S. Navy General Designation for Torpedo Bomber Aircraft

T Airframe Manufacturer Code Letter Assigned by the Navy to Northrop

TBD Douglas TBD Devastator Torpedo Bomber

TBF Grumman TBF Avenger Torpedo Bomber

TBM General Motors (Eastern Aircraft Division) TBM Avenger Torpedo Bomber

U Airframe Manufacturer Code Letter Assigned by the Navy to the United Aircraft Company (Vought, later Chance-Vought, later Vought-Sikorsky)

Military Unit Designations

CASU Carrier Aircraft Service Unit

CQTU Carrier Qualification Training Unit

MAG Marine Air Group

MAW Marine Air Wing

VB U.S. Navy Bombing Squadron

VC U.S. Navy Composite Squadron

VF U.S. Navy Fighting Squadron

VG U.S. Navy Carrier Air Group

VMF U.S. Marine Corps Fighting Squadron

VMSB U.S. Marine Corps Scout Bombing Squadron

VS U.S. Navy Scouting Squadron

VSB U.S. Navy Scout Bombing Squadron

VT U.S. Navy Torpedo Squadron

Ship Types

AO Fleet Oiler

APV Aircraft Transport

AV Seaplane Tender

BB Battleship

CA Heavy Cruiser

CL Light Cruiser

CV Aircraft Carrier

CVE Escort Carrier

DD Destroyer

IX Miscellaneous Auxiliary

U.S. Navy Ranks and Rates

Sea3c/2c/1c Seaman Third Class/Second Class/First Class

AMM3c/2c/1c Aviation Machinist's Mate Third Class/Second Class/First Class

AOM3c/2c/1c Aviation Ordnanceman Third Class/Second Class/First Class

ARM3c/2c/3c Aviation Radioman Third Class/Second Class/First Class

MACH Machinist (Warrant Officer Grade)

CHMACH Chief Machinist (Warrant Officer Grade)

ACRM Aviation Chief Radioman

ENS Ensign

LT (jg) Lieutenant (Junior Grade)

LT Lieutenant (Senior Grade)

LCDR Lieutenant Commander

CDR Commander

CAPT Captain

RADM Rear Admiral

VADM Vice Admiral

ADM Admiral

U.S.M.C. Ranks

PVT Private

PFC Private First Class

CPL Corporal

SGT Sergeant

SSGT Staff Sergeant

TSGT Technical Sergeant

MSGT Master Sergeant

MTSGT Master Technical Sergeant

2ndLT Second Lieutenant

1stLT First Lieutenant

CAPT Captain

MAJ Major

LTCOL Lieutenant Colonel

COL Colonel

BGEN Brigadier General

MGEN Major General

LTGEN Lieutenant General

GEN General

Miscellaneous Terms and Abbreviations

a/c aircraft

AG Air Group (also can be VG, in the case of carrier AGs)

A-V(N) "Aviation officer USNR holding the designation of naval aviator generally qualified for duty afloat and ashore" (Cressman et al 1992, viii).

BatFor Battle Force

BuAer U.S. Navy Bureau of Aeronautics

BuNo U.S. Navy Bureau of Aeronautics Aircraft Number

BuShips U.S. Navy Bureau of Ships

CAG Commander Air Group

CAP	Combat Air Patrol
CINCPAC	Commander-in-Chief Pacific Fleet
CLAG	Commander, USS *Lexington* Air Group
CO	Commanding Officer
CPO	Chief Petty Officer
DFC	Distinguished Flying Cross
FOD	Foreign Object Damage
GP	General Purpose Bomb
HMAS	His Majesty's Australian Ship
HMNS	His Majesty of The Netherlands' Ship
HMS	His Majesty's Ship
KIA	Killed in Action
KIA/BNR	Killed in Action/Body Not Recovered
LSO	Landing Signal Officer
MIA	Missing in Action
mm	millimeter
NAP	Naval Aviation Pilot
NAS	Naval Air Station
NAVC	Naval Aviation Cadet
PO	Petty Officer
P & W	Pratt & Whitney Aircraft Corporation
RN	Royal Navy

RPM	Rotations Per Minute
S/N	Serial Number
SNAP	Senior Naval Aviator Present
T.H.	Territory Hawaii
TF	Task Force
TG	Task Group
USS	United States Ship
WAC	Wright Aircraft Corporation
XO	Executive Officer

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Appendix 1: Organization and Disposition of *Lexington* Air Group Dauntlesses in the Coral Sea Actions

Appendix 2: List of SBD-2s Lost to Operational Causes Outside the Continental United States between 7 December 1941 and October 1942 (Arranged by BuNo)

Summary

There is evidence to suggest the existence of no more than 31 Dauntlesses and Banshees in varying forms between the late 1960s and 1995, and the present status of a number of these is unknown (Chapman and Goodall 1989, 67-68). Of these aircraft, there remains only one SBD-1 (BuNo 1612), and only one extant accessible SBD-2 (BuNo 2106), making this the second oldest surviving Dauntless in the series. This dismal survival rate is largely a reflection of the high rate of attrition experienced by all of the aircraft types which participated in the early Pacific operations such as the Pacific Raids of early 1942, Coral Sea, Midway, Guadalcanal, and Eastern Solomons. SBDs were no exception to this attrition, and furthermore they remained in service after the rest of their early counterparts had finally been phased out. The F4F/FM, TBD, SBD, and to a lesser extent the SB2U and F2A out of necessity became the workhorses of the early Pacific engagements at a time when some of these aircraft were already considered obsolete. Their intended replacements, Vought's F4U Corsair and Grumman's F6F Hellcat, TBF/TBM Avenger, and SB2C Helldiver designs, were not yet in wide circulation. Particularly, many SBD-1s, -2s, and -3s were casualties of combat or went down with the four carriers *Lexington*, *Yorktown*, *Wasp*, and *Hornet* lost during the 1942. A large number of these early losses were accounted for by four particular occurrences: the Pearl Harbor Attack, the early Pacific raids of 1942, the Battle of the Coral Sea, and the Battle of Midway.

Regarding the SBD-2s in particular, of the 87 originally constructed, at least 50 were lost by the Navy and Marine Corps in combat-related operations between 7 December 1941 and 2 October 1942 (BuAer, AList of Navy and Marine Corps Aircraft Expended Outside the

Continental Limits of the United States between 7 December 1941 and 15 August 1945≅).

The Pearl Harbor Attack

During the Japanese Raid on the Territory Hawaii's military assets, Marine Air Group TWENTY-ONE (MAG-21) suffered seventeen SBD-1s destroyed on the ground, and all of their remaining twelve damaged (Stern 1988, 7). Additionally, two *Lexington* Air Group SBDs at NAS Ford Island. BuNos 2112 of VB-2 and 2146 of VS-2 were also destroyed. Furthermore, eighteen SBD-2s launched off the inbound *Enterprise* arrived over Pearl Harbor during the raid, literally flying right into the beginning action of the war. At least six of these Dauntlesses were shot down and destroyed (Stern 1988, 10). These included four -2s (BuNos 2158, 2159, 2160, and 2181) and two -3s (BuNos 4570 and 4572) (personal communication, Robert Cressman to Rich Wills, 1996).

The Early Pacific Raids, 1942

During the Kwajlein Raid of 1 February, five *Enterprise* SBDs were lost while attacking Roi Island (Tillman 1976, 26). On 10 March, one of VS-2's SBD-2s (BuNo 2130) was lost in the Lae-Salamaua Raid when it was destroyed in midair by anti-aircraft fire and its crew killed (Cressman 1994, 24). On 24 February one of VS-6's Dauntless (BuNos unconfirmed) was lost during the raid on Japanese-occupied Wake Island; a second VS-6 SBD was lost at Marcus on 4 March. In both cases, the six crews were recovered by the Japanese and became POWs. In the

former case, both men were later lost when the ship in which they were being transported to Japan, the victualing ship *Chichibu Maru*, was torpedoed and sunk by U.S. submarine *Gar*. The second VS-6 crew reached Japan safely where the men remained until the end of hostilities (Tillman 1976, 26).

The Battle of the Coral Sea

The Battle of the Coral Sea proved particularly deadly for Dauntlesses, as a large number of SBD-2s and -3s were lost in combat, consigned to the deep upon their return due to severity of damage, or went to the bottom with *Lexington*. Commander, *Lexington* Air Group (CLAG) (CDR Bill Ault) and his radioman-gunner were among those lost. It is believed that they were not flying the aircraft that was officially designated as that of CLAG at the time. In an engagement marked by numerous displays of heroism, gallantry, and sacrifice, perhaps the documents recording of the loss of CLAG and his backseater leave the most tragic reminder of the frailty of the flying squadrons and their aircraft, and demonstrate the relatively primitive state of shipboard radar and directional technology at that early stage of the war. Because of the damage absorbed in the Japanese strike on the American fleet, the crippled *Lexington* could no longer train its CXAM radar, and therefore turned over aircraft directional duties to *Yorktown*, which was also damaged. It was shortly following this that Athe last act in the drama of the *Lexington* strike group...played to sympathetic listeners≅ in *Yorktown*=s communications section (Lundstrom 1984, 353). Two straggling SBDs, those of CLAG and one of the VS-2 crews from his command section, were lost somewhere at sea and running out of fuel. In a weak radio

transmission, CDR Ault reported he and his gunner were both wounded, and asked if *Lexington* had acquired him on radar and could direct him home. *Yorktown* reported back to him that it could not register Ault on its radar, and thus could not assist him in navigating his way home. Another *Lexington* pilot still aloft could also copy Ault=s messages, Aenough to tell that the group commander was far away≅ (Lundstrom 1984, 353). The surviving transcript of the radio traffic offers the final chapter to the proud history of the *Lexington* Air Group:

> 1451 CLAG to *Yorktown*: SHALL I CIRCLE X DO YOU WANT ME TO GAIN OR LOSE ALTITUDE X I HAVE GAS LEFT FOR ABOUT 20 MINUTES
> 1452 *Yorktown* to CLAG: YOU ARE NOT ON THE SCREEN X TRY TO MAKE NEAREST LAND
> 1453 CLAG to *Yorktown*: NEAREST LAND IS OVER 200 MILES AWAY X WE WOULD NEVER MAKE IT
> 1454 *Yorktown* to CLAG: YOU ARE ON YOUR OWN X GOOD LUCK
> CLAG to *Yorktown*: PLEASE RELAY TO OOV56 [*Lexington*] WE GOT ONE 1,000 POUND BOMB HIT ON A FLAT TOP X WE HAVE BOTH REPORTED 2 OR 3 TIMES X ENEMY FIGHTERS X AM CHANGING COURSE TO NORTH X LET ME KNOW IF YOU PICK ME UP
> *Yorktown* to CLAG: ROGER X YOU ARE ON YOUR OWN X I WILL RELAY YOUR MESSAGE X GOOD LUCK
> From CLAG: OK X SO LONG PEOPLE X WE GOT A 1,000 POUND HIT ON THE FLAT TOP (Cressman 1985, 111).

Also onboard *Lexington* during the Battle of the Coral Sea were the Dauntlesses of VS-2. Three of VS-2's Dauntlesses were lost on 7 May (Tillman 1976, 52), including 2-S-9 (BuNo unconfirmed), which ditched at sea with its crew being rescued 17 days later, and 2-S-10 (BuNo uncomfirmed), which was shot down and lost with its crew (Tillman 1976, 39). On 8 May a total of 13 Dauntlesses (six from *Yorktown* and seven from *Lexington*, BuNos unconfirmed) were lost in combat, including two from VS-5 and three from VS-2 (Tillman 1976, 46-48, 52). In addition to the bodies of 216 men, *Lexington* also took to the bottom a total of 36 planes, consisting of 14 SBDs, 13 TBDs, and nine F4Fs (Morison 1949, 60). The fate of Scouting TWO's aircraft

following the *Lexington*'s sinking must be researched further. While the fate of all of these aircraft is not confirmed, some information is reconstructed by Tillman (1976) (see Appendix 1) and also upon a partial accounting by Lundstrom and Sawruk (1988, 26-28) of the 8 May SBD anti-torpedo plane patrol. VB-2 lost no Dauntlesses in combat on 7 May, but six were damaged (Tillman 1976, 39), and one of these damaged aircraft, 2-B-13, BuNo unconfirmed, but probably either 2186 or 2188, crash-landed and was pushed over the side (Tillman 1976, 52 and 101). A lesser number of aircraft, including five of Bombing TWO's Dauntlesses, transferred aboard *Yorktown* and were saved (Tillman 1976, 53). Nearly all of the VB-2 SBDs that were lost, at least eleven were -2s.

The Battle of Midway

The eight USMC SBD-2s lost at Midway on 4 June were BuNos 2103, 2119, 2122, 2129, 2139, 2148, 2169, 2184. Four others were Aseverely damaged beyond repair, having numerous bullet and shrapnel holes, torn fabric, and overspeeded engines - out of commission,≅ these were BuNos 2106, 2111, 2142, and 2144. Three were Aslightly damaged or undamaged and in commission,≅ these were BuNos 2124, 2162, and 2178. BuNo 2107 was Aslightly damaged by shrapnel but in commission≅ as of 5 June (ACommanding Officer=s Report of Activities of VMSB-241 During June 4 and June 5, 1942≅ (12 June 1942), 6).

In addition to VMSB-241's losses, the battle claimed 20 Dauntlesses and 24 SBD crewmen from *Enterprise*, five Dauntlesses and two SBD crewmen from *Hornet*, and 15 Dauntlesses and six SBD crewmen from *Yorktown*. Furthermore, three *Yorktown* and two

Enterprise SBDs went down with *Yorktown* in 3,000 fathoms (Cressman et al 1992, 220). This provides a total of 53 Dauntlesses lost in the Battle of Midway. Of course, many more of the surviving SBDs sustained varying levels of damage.

Appendix 3: Directory of Known Surviving Dauntlesses and Banshees as of 1996

Surviving Dauntlesses and Banshees as of 1996

The following entries are compiled from the combined resources of Chapman and Goodall (1989, 67-68), Tillman (1976, 212-214), and NMNA recovery records.

Chapman and Goodall have compiled the most extensive listing, although they do caution that "all aircraft are currently thought to be extant, unless otherwise noted." Their accounting is provided below:

"Summaries include A/C MFGR, Constr. No., A/C Designation, Military S/N, Civil Registration, owner(s)/location(s)."

SBD-3
"N4522 San Diego Aerospace Museum, San Diego CA
(c/n quoted "DER-2") added to US Civil Air Registration 7/87"

A-24A
"2350 (MFGR construction no.)/42-60817
N9142H City of Portland Mosquito Control, Portland, OR by 58/at least until 63
N15749 USMC Museum, MCAS Quantico VA by 65 at least until 69
USNAM (?), NAS Pensacola FL by 66 at least until 85 "

SBD-4
"2478/BuNo 10518
MGM Studios, Culver City, CA (wind machine) late 60's
The Air Museum, Ontario Canada late 60's
N4864J Yankee Air Corps, Chino, CA 4.84 at least until 88"

SBD-5
"3883/BuNo 28536
to RZNAF as NZ5062
MGM Studios, Culver City, CA (wind machine) late 60's
The Air Museum, Ontario Canada late 60's at least until 78
N670AM The Air Museum, Chino CA 4.84/88"

4297/BuNo 28950 (current disposition unknown)
"N..... ex disposals, at Grand Central Airport, CA at least until 46"

A-24B
"17371/42-54532
to F A Mexicana
XB-QUC Compania Mexicana Aerophoto SA
noted Mexico City, used for photographic work 12/63
Tallmantz Collection, Orange County, CA by 7/64
The Air Museum, Ontario CA 65-67
N54532 Robert L. Griffin, San Antonio, TX 70-72
(donated to the CAF following restoration at Ontario)
Confederate Air Force, Harlingen TX 10/78-88"

"17421/42-54582
N4488N Marsh Aviation, Litchfield AZ 54
City of Portland Mosquito Control, Portland OR 63-69
Pacific Aeronautical Corp., Lake Oswego OR 71-74
N17421 Windward Aviation Inc, Enid OK 3/74-88
USMC Museum, MCAS Quantico VA 75-87"

"17444/42-54605
USMC Museum, MCAS Quantico VA
NASM, Washington, DC 75-87"

"17482/42-54643
MGM Studios, Culver City CA (wind machine) late 60's
Bradley Air Museum, Windsor Locks CT 75-79
(fuselage only)"

"17493/42-54654
MGM Studios, Culver City CA (wind machine) late 60's
Military Aircraft Restoration Group, Chino CA 79-88"

"17521/42-54682
to F A Mexicana
XB-ZAH Compania Mexicana Aerophoto SA, Mexico City until 63
noted engineless, Mexico City 12/63
Movieland of the Air, Orange County CA 4/64
N74133 Rosen-Novak Auto Co., Omaha NE 66
remained on display at Movieland of the Air Museum, until auctioned 29/5/68
John McGregor, Los Angeles CA 69
wfu, San Fernando Valley CA: Off USCR by 72
Admiral Nimitz Foundation, Fredericksburg TX 72-85
(restored for display. Trade School, Waco TX)"

"17621/42-54782
NL9449H noted in civil scheme, New York NY 46
N9449H Seaford & Western Airlines Inc., NY 63-69
(current disposition unknown)"

"17651/42-54812
N46472 no further info, off USCR by 63
current disposition unknown"

"-----/-----
noted in civil scheme, Renton WA 48
current disposition unknown"

"-----/-----
MGM Studios, Culver City CA (wind machine) late 60's
disposal, present whereabouts unknown"

"-----/-----
MGM Studios, Culver City CA (wind machine) late 60's
disposal; present whereabouts unkown
(=a total of 6 wingless A-24-s disposed of by MGM)"

(2) SBD-?
"-------
recovered from Lake Michigan c81
Yankee Air Museum, Chino CA
Military Aircraft Restoration Group, Chino CA 88
(in compound: id appears ?1195? as of 8/88)"

"**-------**
recovered from Vanuatu c87
RNZAF Museum, Wigram NZ"

See also selections from "National Museum of Naval Aviation Underwater Salvage Operations Status of Recovered Aircraft as of 01/20/95" for details concerning the following Dauntlesses:

SBD-1 (BuNo 1612)
SBD-2 (BuNo 2106)
SBD-3 (BuNo 06508)
SBD-3 (BuNo 06583)
SBD-3 (BuNo 06624)
SBD-3 (BuNo 06626)
SBD-3 (BuNo 06694)
SBD-4 (BuNo 06833)

SBD-4 (BuNo 06900)
SBD-4 (BuNo 10575)
SBD-5 (BuNo 36173)
SBD-5 (BuNo 36175)

See also Tillman (1976, 214) for further information on some of those already listed, as well as:

SBD-6
Serial Number: BuAer 54605
FAA Registry: ----
1975 Location: NASM, Smithsonian Inst. Washington, D. C.
1975 Status: Under Restoration

Finally, the **SBD-2** BuNo 2117 is known to still be in Lake Michigan, albeit it has yet to be recovered. **SBD-2**s BuNos 2111, 2173, and 2183 may also be in Lake Michigan. Further research is required in the cases of the last three. Last minute information received as this report reaches completion indicates that 2111 may possibly be even more historically significant than its sister ships 2106 and 2117.

Appendix 4: Biographical Sketches of the Combat Aircrews of BuNo 2106

The Combat Aircrews of BuNo 2106

While a large number of men and women undoubtedly had a part in the design, crafting, construction, maintenance, repair, handling, and flying of BuNo 2106, four naval aviation personnel in particular possessed a relationship with the aircraft during the pivotal moments of its operating life: Mark T. Whittier, Forest G. Stanley, Daniel Iverson, Jr., and Wallace J. Reid. These four aviators all appear in historical literature. Collectively they personify the sacrifices made by those American naval aviation personnel who participated in the Second World War. Their contributions are discussed below.

Mark Twain Whittier

In addition to his Navy Cross, Mark Whittier ultimately earned a Distinguished Flying Cross and four Air Medals in the Pacific Theater, commanding Composite Squadron NINETY SEVEN (VC-97) as it operated from the escort carriers *Shipley Bay* (CVE 85) and *Makassar Strait* (CVE 91) (Whittier 1992; Cressman 1994, 26). Whittier survived the Second World War and eventually retired with the rank of captain. He recently wrote of his experiences in a memoir entitled *Instead of Becoming a Doctor...*, and even more recently has recorded a short reminiscence of his favorite VB-2 assigned aircraft, BuNo 2106. CAPT Mark T. Whittier, USN (Ret.) is alive and well in California at the time of this writing, and he intends to journey to Pensacola to see the aircraft he knew as ATwo-Baker-Two,≅ which took him on Athe prize ride of his career,≅ and with which he parted ways so long ago.

Forest G. Stanley

In addition to his participation in the Lae-Salamaua Raid and other early fleet combat operations, Forest Stanley fought with VB-2 in the Battle of the Coral Sea, where he was credited with an aerial victory over an attacking fighter during the strike on the Japanese carrier *Shoho* (Lundstrom 1976, 250). He earned a Distinguished Flying Cross (DFC) in that engagement, during which he flew in 2-B-14, piloted by LT (jg) Robert B. Buchan. The following day he flew again with Buchan, but this time in 2-B-1, BuNo 2117, which was one of the five VB-2 surviving aircraft that eventually made it to the *Yorktown* instead of sinking with the *Lexington* (Tillman 1976, 40).

After his ship went down at Coral Sea, Stanley was transferred to Bombing Squadron TEN (VB-10) in *Enterprise*, where he was promoted to Aviation Radioman First Class (ARM1c). In addition to Stanley, a number of other old *Lexington* Air Group hands were also assigned to Air Group TEN, including backseaters Schindele, Teyshak, Hynson, and the irrepressible John Liska. VG-10 was one of the Navy=s very first Carrier Replacement Air Groups, and its core was constituted of seasoned aviation personnel (Lundstrom 1976, 549).

During the Solomon Islands campaign, after the torpedoing and withdrawal of *Saratoga*, and the destruction of both *Hornet* at Santa Cruz and *Wasp* off Guadalcanal, American carrier aviation reached its weakest point in the entire war. By the crucial month of November 1942, the damaged *Enterprise* had become the only remaining operational American carrier in the entire South Pacific. Wanting to offer that vessel maximum protection, ADM William F.

Halsey, Commander, South Pacific (ComSoPac) stationed *Enterprise* at a position southwest of Guadalcanal, from where Air Group TEN could stage offensive operation against Japanese forces, operating in AThe Slot≅ using Guadalcanal=s Henderson Field as a staging and refuge area (Stafford 1976, 199). It was during this critical time at Henderson, in the midst of a VB-10 raid on Japanese transports off Guadalcanal in November of 1942, that Petty Officer Stanley was lost. On 14 November 1942, seven Bombing TEN Dauntlesses, led by LCDR J.A. Thomas, the VB-10 CO, lifted off to stage an attack on a Japanese transport attempting to resupply the Japanese landbound forces. The aircraft were formed up into two sections, with LCDR Thomas at the head of the first section, and LT V.W. Welch, Bombing TEN=s XO, leading the second. The last two aircraft in LT Welch=s section were the SBDs of LT I.D. Wakeham and ARM1c Forest Stanley (in SBD-3 BuNo 06644), and of ENS Len Robinson and ARM1c Teyshak. At an altitude of 12,000 feet the formation sighted five troop transports headed for Guadalcanal. Momentarily thereafter, all seven aircraft were jumped by a dozen Zeroes. Led by Thomas, the SBDs pushed over into their dives in pairs. As the ships were pushing over the Zeroes made runs on them from all sides, so that the Dauntlesses presented the picture of Afree guns sweeping from side to side to meet the nearest threat≅ (Stafford 1976, 218). The Zeroes could not keep up with the Dauntlesses in their braked 70-degree dives, and because of this they concentrated on doing as much damage as possible at the push-over point. Stafford recounts that:

> Robinson and Wakeham were the last two planes of the seven and the enemy fighter pilots gave them special attention. Like Thomas and Stevens in the lead, the two SBDs locked themselves in a tight formation, their gunners sitting only a few feet apart to present four .30 calibers to each banking, swooping Zero in succession. But the enemy fighters came in from ahead and astern at the same time. Wakeham and Robinson bored in for the pushover point, firing their fixed guns at the enemy ahead while Stanley and Teyshak handled the ones astern. Robinson

> watched his tracers knock pieces of cowling from a Zero making a head-on run and saw its prop falter before it flashed past below. Then he was conscious of 20-millimeters and 7.7s eating into his left wing and moving up into Wakeham=s right. As Robinson skidded right, out of the line of fire, Teyshak saw the guns in the other Dauntless go silent and swing up as Stanley slumped over their breeches. Before Robinson could close in again, a 20-millimeter exploded in his engine, stopping it and sending flames licking back toward the canopy. He sideslipped violently until the lateral windstream blew out the engine fire, then pushed over into a violent dive to escape the Zeroes which continued to fire all the while...Robinson and Teyshak landed at Henderson Field at 5:30 P.M. and counted sixty-eight holes in the SBD...The VB-10 pilots waited in weary and desultory conversation for their exec and the other two pilots of his section, but they did not return (Stafford 1976, 217-219).

Forest Stanley was awarded a second air medal posthumously (Cressman 1994, 26).

Wallace J. Reid

At the time of the Pearl Harbor Attack, Wallace J. Reid was temporarily attached to VMF-211's Midway detachment (APrelude,≅ VMF-211 Commanding Officer=s Quarterly Report of Readiness for Period 1 January to 31 March 1942, 2). Records also indicate that in addition to being wounded during the Battle of Midway in June of 1942, Reid was wounded in the Solomons in October of 1942 (personal communication, Ken Snyder to Rich Wills, 1995). Reid earned a Distinguished Flying Cross for his actions at Midway, and he earned a Silver Star at Guadalcanal. By the time of his receiving the Silver Star, Reid had risen to the rank of Staff Sergeant. SSGT Reid was presented the Silver Star in an impressive ceremony held at MCAS Cherry Point on 17 April 1943, before the entire Third Marine Air Wing. Reid=s citation was worded as follows:

> For conspicuous gallantry and intrepidity while serving as gunner in a scout plane attached to Marine Aircraft Group 14, on patrol over New Georgia Channel, October 8, 1942, subject to a devastating attack by an overwhelming force of enemy fighter planes as well as intense antiaircraft fire, Staff Sergeant Reid maintained constant and effective fire against the superior opposition until his guns jammed. He then rendered valiant service by indicating to the pilot the course to steer in evading enemy fire. Largely as a result of his action, the pilot and the

plane were saved (Letter, Secretary of the Navy to SSGT Wallace J. Reid, USMC, undated)

Reid eventually was awarded a total of two more DFCs and eight Air Medals in the course of the Solomons and Bismarck Archipelago campaigns (Cressman 1994, 26).

Wallace Reid apparently remained in the Marine Corps after the Second World War came to an end, and August of 1950 found him in the midst of the Korean War. Hoyt's (1984) account finds Reid, who has by this time worked his way up through the enlisted ranks to the commissioned officer's grade of 2ndLT, on the Pusan Perimeter and involved in the effort to take Hill 342. Hoyt describes the actions of the 2nd Platoon, Company D (2nd Battalion, 5th Regimental Combat Team). Company D's platoon leader was 2ndLT Reid.

> After having spent a sleepless night marching to Chindong-ni, and coming under fire from nearby Tokkang-ni as the temperature reached 100°, Finn [Captain John Finn, Jr, USMC, CO of Company D] ordered his men into the rice paddies bordering the road. Calling his platoon leaders, he told them there was no real intelligence, but that the fire from Tokkong-ni would be ignored due to the company's mission on 342. He assigned routes of ascent to each platoon. The 2d, under Second Lieutenant Wallace J. Reid, would push through Taepyong-ni and on up the hill at its juncture with the spur. The 1st Platoon, commanded by Second Lieutenant Arthur A. Oakley, would hold the right flank and ascend the southern slopes of 342 itself (Hoyt 1984, 113).

Just before dawn on the following morning, the Marines met with some fierce resistance, which Hoyt recounts.

> Company D fared no better than its predecessors at consolidating the crest of 342 and clearing upper slopes which was crawling with North Koreans. Finns's unit took several casualties in the firefight that accompanied and followed the relief of the original defenders. Two of those killed in action were Second Lieutenants Oakley and Reid. The only surviving platoon leader, Lieutenant Emmelman, received a serious head wound as he was pointing out targets to a Marine machine gunner.
>
> Captain Finn, seeing Reid's motionless form lying ahead of the company lines, crawled forward to recover the body. Having moved only a short distance with his burden, the company commander himself was struck in the head and shoulder by enemy bullets. Barely conscious and almost blinded by blood, Finn crept back to his lines on his hands and knees (Hoyt 1984, 115).

Ironically, Wallace Reid lived through an extremely tumultuous tour of duty as a marine aviator during the deadliest days of the early Pacific War, survived wounds he received during perilous aerial engagements, and rose from the rank of private to that of a commissioned officer only to die in combat on a North Korean hillside.

Daniel Iverson, Jr.

Daniel Iverson, Jr. earned his wings in the Class of 139-C at NAS Pensacola on 4 March 1940 (letter, Margaret Johnson, National Museum of Naval Aviation to Margie Bordelon, no date). His service duty record records that he Aparticipated in the defense of Ewa Field, Oahu, T. H. against Japanese aerial attack December 7, 1941.≅ Iverson was awarded the Navy Cross for his accounts at Midway, and his duty service record indicate that he was wounded there, for which he received a Purple Heart. Like Wallace Reid, Daniel Iverson, Jr. was awarded a Silver Star at Guadalcanal. And like Reid, he was also wounded there, on 13 September 1942, for which he was presented a second Purple Heart (Sherrod 1952, 60).

Following the defense of Midway, Thomas Moore was assigned to the newly established VMSB-232, part of the ACACTUS Striking Unit≅ where, ADanny Iverson and [CAPT] Bruce Prosser were assigned with me≅ (Moore 1943, 84). For Moore, who was the second Marine pilot to land in the Solomons, and who flew out of Guadalcanal=s Henderson field until he was badly injured in a crash during takeoff following an aircraft engine failure, Athe memory of Midway...left no illusions of confidence or valor≅ (Moore 1943, 92). In addition to containing excellent information regarding the defense of Midway Island, Moore=s *The Sky is My Witness*

(1943) is also valuable for the descriptions of Marine aviation in the Solomons during the latter half of 1942. Iverson appears in the book in a number of passages, and the shared experiences of Moore and Iverson may perhaps be considered as being very parallel. During their voyage to the island of Guadalcanal in the USS *Aylwin* (DD-355), Moore records that the Marine flyers were not informed of their destination. The pilots all speculated wildly, including ADanny Iverson [who] said it was Tokyo≅ (Moore 1943, 89). As three of the veterans on the voyage, Aothers...were beginning to ask more pointed questions of Prosser and Iverson and me...≅ (Moore 1943, 88).

Following their arrival at the very rough Henderson Field (named after VMSB-241 CO MAJ Lofton Henderson), the Marine pilots were quartered in open canvas shelters and given captured Japanese blankets. Moore describes his first night on Guadalcanal:

> Mosquitoes came with the night, mosquitoes almost as big as moths. I had not brought my mosquito netting, and for a while I endured their vicious raids with little complaint. I didn't want to invade the privacy of anyone else=s netting, but it became too much. Discretion won over valor, and I moved myself under Danny Iverson=s canopy because I thought he would be the last to object.
>
> Everyone was asleep. Only the buzzing of mosquitoes, the quick patter of a rat=s feet, the shush, shush sound of a crawling lizard, a grunt or snore where audible. I thought a few thoughts, and then I, too, fell asleep.
>
> > *A smash of thunder!* - but it wasn=t thunder. It was an artillery sound, a big artillery sound. Danny sat up with a start. For the first time he noticed me planted no more than an inch from his face. His mouth flew open, and I still don=t know whether it was from the shock or from the sight of me. But before he could speak, another explosion and another. It seemed as if everyone was awake. A babble of voices broke out almost on me. Someone was grinding at a cigarette lighter before a curse and a shout did away with that threat.
> > There was a long-drawn-out wailing.
> > Someone yelled, >Duck!=
> > We all ducked. There was a deafening explosion not far away.
> > A shaky voice: AHey, they=re not fooling.≅
> > Bruce Prosser=s voice: ATake it easy. We=ll never hear the one that gets us.≅
> > Danny, Bruce, and I had been through this once before and we had little to say... (Moore 1943, 102-103).

Following his nearly fatal crash but before his departure to a hospital ship, Moore=s

fellow aviators visited him in the forward dressing station to which he and his radio-gunner had been taken. Iverson may have been one of this group. Moore relates:

> That evening my squadron mates arrived to visit me. By lantern light I looked at each and every one of them, standing about my bed looking awkward and trying so hard to look casual. They were so few, so very few. Even the little tent was not crowded by their presence...When I said good-by, to some of them it meant good-by for always - the next day they would fly again (Moore 1943, 126-127).

Tillman (1976) provides a very brief description of the action of the 25 August 1942 early morning hours in which five Japanese destroyers shelled an area near Guadalcanal for two hours.

> [VMSB-232 CO LTCOL Richard H.] Mangrum took two of his pilots, Captain Iverson and Lieutenant Baldinus, aloft at 0230 to exact some sort of revenge upon the offending vessels, but no hits were obtained. 'I doubt we accomplished much more than astonish the hell out of them,' Mangrum said (Tillman 1976, 101-102).

Casey (1942) discusses the Guadalcanal air actions of 28 August 1942, when four Japanese destroyers were bound for Guadalcanal with the intent to land Japanese infantry reinforcements. The mission of these troops was to recapture the Marines' crucial Henderson Field. Casey records:

> At 1700 hours, August 28, a pair of VMSB-232 Dauntlesses out of Henderson Field piloted by 1stLt Danny Iverson and 2dLt Hank Hise were tooling along at 130 knots on evening patrol over the Russell Islands when Hise spotted the four destroyers silhouetted against the setting sun only 70 miles from Cape Esperance.
>
> Because they both lacked radios, Hise thought Iverson might have failed to see the targets. But Iverson had seen them; he just assumed they were Americans. To Hise's chagrin, the flight leader dropped down so his gunner could flash a recognition signal with his Aldis lantern. The Japanese blinked back with their automatic weapons batteries. Iverson pulled up, with Hise following, to 7,000 feet, where they topped a thin layer of clouds.
>
> Next, without any warning whatsoever, Iverson pitched through a hole in the clouds. Startled, Hise armed his 500-pound bomb and followed. The Japanese by then were maneuvering every which way. Hise selected a target running straight across his flight path and continued to bore in, scared to death as he noted how many guns were firing at him. He cut his bomb loose at 2,500 feet, certain he had missed by a good half-mile.
>
> Unable to find Iverson upon recovering from his dive, Hise headed home, where he taxied straight up to the Pagoda- a distinctive Japanese building that housed the Cactus Air Force operations center- to report his find. Soon Iverson arrived safely home with his bomb still aboard

to tell how he had been unable to get lined up on either of his two dives.

Hise's report was followed by a late scramble of eleven Marine and Navy Dauntlesses, which succeeded in sinking one of the destroyers and damaging two more, at the expense of one Marine SBD lost...the force was turned back (Casey 1942, 243-244).

For participating in the 24 August and 29 August actions, and another on 7 and 8 September, CAPT Iverson received a Silver Star. His citation was worded as follows:

For gallantry and intrepidity in aerial action against the enemy, while serving with Marine Scout-Bombing Squadron 232 on Guadalcanal, S.I.

At 0130 on 25 Aug. 1942 Capt. Daniel Iverson, Jr., took off from the air base on Guadalcanal in an SBD-3 airplane as a member of a 3 plane section which located and attacked 1 light cruiser and 4 destroyers which had shelled the camp area at midnight. These planes bombed the enemy ships, scoring close misses and followed with a strafing attack. Visibility conditions were very poor. Oil slicks were found the next day that indicated that damage had been inflicted.

On 28 Aug. 1942, Capt. Iverson participated in an attack on 4 enemy destroyers 20 mi. north of Ramos Is. which resulted in the destruction of 3 of these ships.

On 7 and 8 Sept. 1942, during a landing operation by our Raiders in the vicinity of Tasimboko, Capt. Iverson made several reconnaissance flights and led sections in bombing attacks supporting ground troops. By his intelligent and vigorous action during this operation and willingness to fly at low altitude despite enemy fire in order to gain close familiarity with the terrain he was able to render valuable service to the ground organization (Pilot History Card for Daniel Iverson, Jr., NHC-AVH, Tray 1, Roll 86, 3-4).

Not long after these actions, Iverson was detached from VMSB-232 and transferred to the United States. He received another promotion, a temporary one, to the rank of Major. MAJ Iverson was appointed as a flight instructor at NAS Vero Beach, allowing him to be close to his family in nearby Miami. On 22 January 1944 he was killed as the result of a midair collision while instructing a student off the eastern coast of Florida (Bell 1944; Cressman 1994, 26). Iverson's death was reported in a front page *Miami Herald* story.

Vero Beach Crash Kills Maj. Iverson: Daring Miami Flier Dies in Plane Dive

Another gallant Marine, Maj. Daniel Iverson, Jr., is dead! The daring young airman, who flew through Japanese flak and Zero gunfire through August and September of 1942, was killed Saturday morning at the United States Naval training base at Vero Beach.

His father, the Rev. Daniel Iverson, Sr., of Shenandoah Presbyterian Church, had few details of the accident, other than the fact that his son's plane collided with another high over the field as they were diving at a practice sleeve.

'I just received a letter Saturday morning,' the father said, 'on which Dan told me he had

just received orders to report to the West Coast. He thought it meant a return to combat duty and was happy.' The Rev. Mr. Iverson left Miami late Saturday for Vero Beach to join the young Iverson's wife, Mrs. Margaret Fisher Iverson, and her tiny daughter, Margaret Lynn.

DARING PILOT

Maj. Iverson's flying record was one of the finest of the many daring exploits of Miamians in combat. He was the first Miamian reported wounded in the Battle of Midway, June, 1942, in which he won the Navy Cross. For a while, he was missing in action at Guadalcanal, and won the Silver Star medal for meritorious service. His Marine Scout Bombing Squadron carried on brilliant attacks against superior Japanese forces.

Maj. Iverson's citation read, in part:

'Shortly after midnight Aug 25, Capt. Iverson led a three-plane section to attack an enemy cruiser and four destroyers. In spite of poor visibility and fierce anti-aircraft fire, Capt. Iverson and his unit followed with strafing to inflict further damage.'

SERVICES HERE

'Three days later Capt. Iverson assisted in sinking three enemy destroyers. Again on Sept. 7 and 8 during landing operations by our raiders he flew low in the face of determined enemy fire. His expert airmanship and valiant initiative rendered valuable service to the ground organization.'

The official navy notice of the tragedy hasn't been released yet.

The 27-year old flier was a graduate of Miami High School and Davidson College. A younger brother, Lt. Ned Iverson, is a chaplain in the Navy. His parents live at 2131 S.W. 10th St. (Bell 1944, 1).

It is perhaps strangely appropriate that fifty years later, on the front page of the same newspaper that contained the notice of Iverson's death, the discovery of BuNo 2106 was announced and he was remembered. The *Miami Herald* article by Browning (1994) reveals a glimpse of Iverson in which he and his family are remembered in a much more personal light.

WWII Plane's New Mission: Bomber Will Honor Man who Flew it at Midway

Today, Veterans Day, would have been his 78th birthday and, but for the wartime accident that claimed his life, he might have lived to celebrate it. Longevity runs in the family. Iverson's mother, Vivian Thorpe Iverson, celebrated her 102nd birthday Wednesday...

"I remember after Midway he said once, 'There aren't enough medals to give out, to reward all the heroism you see out there. They couldn't make enough medals to do that,' said his sister, Vivian Iverson Gammon, now living in Knoxville, Tennessee."

Iverson's sister recalls that the young Marine airman never dwelt on his exploits at Midway. "Dan came home at Christmastime that year,' she said. 'Dad wanted us all to go into the living room and listen to his heroism, how he won the Navy Cross. When we all got in there and waited, wanting to hear about this great adventure, Dan hesitated and finally said: 'I'm just not going to do it.'"

The day he was killed, Iverson's baby daughter, Dana Lynne, was only six weeks old. 'He never got to be her daddy,' Vivian Iverson Gammon said. 'She went back home with her mother and grandmother to Philadelphia and became a physician. Today she is a marvelous

person.'

Dr. Dana Lynne Iverson Neefe has spent most of her career combating infectious diseases. Now she works for a pharmaceutical firm. 'I think the exploits of my father, as well as those of a whole generation at that time, are all the more remarkable when you consider they were carried out by people in their early 20s,' Neefe said. 'I think the heroism really has to be spread around, not just to my father, but to many more people who gave so much. Finding that plane closed the loop for me. Because of it, I have talked to many survivors of the battle, men who knew my father. They helped me know him. They helped me know myself.'