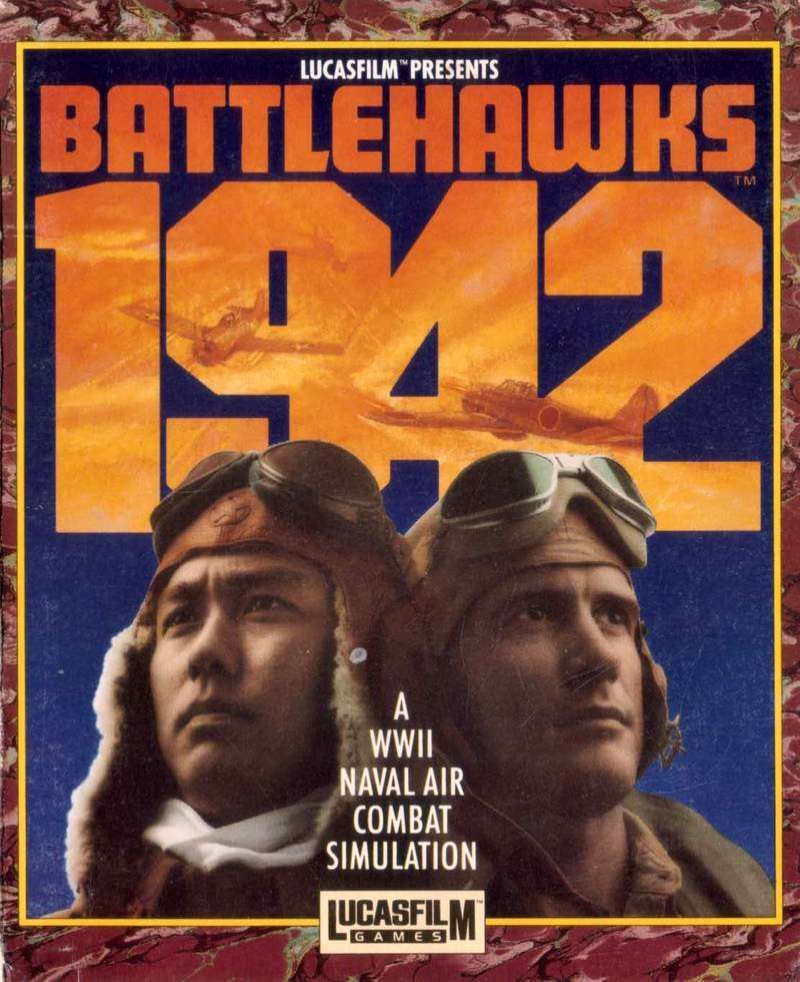
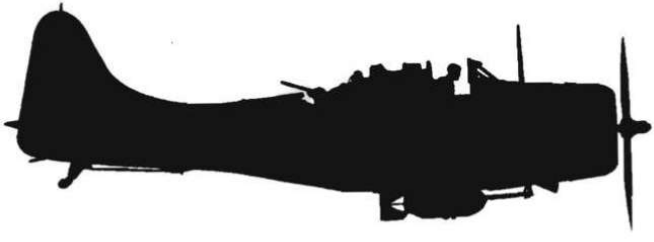

LUCASFILM™ PRESENTS
BATTLEHAWKS
1942™
A
WWII
NAVAL AIR
COMBAT
SIMULATION
LUCASFILM
GAMES

Battlehawks 1942™



Lucasfilm™ Games

"...what a hell of an acey-deucy game we're having down here right now."

Three enlisted men of the *Yorktown*, trapped far below decks, just before the carrier sank on June 7.

Contents

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Special Thanks to George Lucas

Also from Lucasfilm Games:

Maniac Mansion™
Zak McKracken and the Alien Mindbenders™

"Life shrinks or expands in proportion to one's courage."

Anias Nin

Lucasfilm Games, PO Box 10307
San Rafael, CA 94912 U.S.A.

Introduction

Preface

Lieutenant Commander
Richard H. Best

"In 1940, I was ordered from Pensacola, Florida, to a dive-bombing squadron aboard the U.S.S. *Enterprise*. Even though I had been a flight instructor in Pensacola, I was still raw, and untested in battle, like most of the people I first flew with. Perhaps that was an advantage, as I was so pumped up that I wasn't fearful in combat — exhilarated was more like it! I can only speak for myself, but I suspect most other flyers on both sides felt the same way, and those who were scared but flew combat missions nevertheless were the bravest of the brave.

"The six months I flew combat missions from the *Enterprise* were probably the best six months of my life. My greatest thrill came on the morning of June 4, 1942, at the Battle of Midway. As I started my bombing run on the Japanese carrier *Akagi*, I saw its great big tan-colored deck with a tremendous orange Rising Sun painted on the deck just forward of the bridge, and I couldn't believe I was there. I had this tremendous feeling of holding the upper hand; it was heaven!

"I must admit I was a little skeptical when Lucasfilm Games first told me they had a computer program that simulated the excitement of flying combat missions like the ones I flew back in '42. But after seeing the program, I was impressed. I think you'll agree they've done a great job of capturing the details of the cockpits, the feeling of flight, and the sensation of attack. And when you're in the thick of battle, the reactions of the enemy planes and ships are authentic, no matter which side you choose to fight on.

"My advice to you? Fly steady. Make every bomb, torpedo, or round of ammunition count. And above all, have fun!"

Lieutenant Commander
Richard H. Best, U.S.N. (Ret.)

Introduction

Battlehawks 1942 is a World War II naval air-combat simulator that lets you train for — and fight in — the four pivotal naval air battles of the Pacific war in 1942. In *Battlehawks,* you can choose the mission, the plane, and even the country you want to fly for. But whether you fight on the Japanese or the American side, *Battlehawks* lets you relive history, or even rewrite it, if you're good enough!

Through a series of menu choices, you can decide whether to improve your skills with Training missions, or fly the missions that count — Active Duty missions. You then pick the battle you want to fight in, the country you want to fight for, and whether you want to fly fighter escort, fighter defense, dive-bombing, or torpedo-bombing missions. You can also inspect all the aircraft to learn about their strengths and weaknesses. Then, you move to the Ready Room to choose your plane, and make any last-minute modifications to your mission.

Next comes the actual mission itself. You'll find yourself in the cockpit of the aircraft you chose, flying high above the water. Your plane will respond to the controls much the way a real plane does. But you'd better master the basics of flight quickly, because enemy planes and ships are nearby. You'll soon be flying in the face of danger!

When you've completed your mission, you will be evaluated on your performance. Successful sorties will be rewarded with medals and promotion in rank, which will be kept track of in your Service Record.

How to Use This Manual

Although this manual is lengthy, a good deal of it has been devoted to the historical background of the war in the Pacific in 1942. There is also a large amount of detailed information about the ships and planes of that time. Don't worry, you won't need to read every word of the manual before you play the game.

The manual is divided into four parts, *Introduction, Historical Overview, Game Play,* and *Reference Information*. There is also a separate Reference Card, which has specific loading instructions for your particular computer. If you're eager to get into the air in a hurry, see the *Quick Start* section on your Reference Card. With this set of instructions, you can take off on a sample Training mission and get a feel for flying.

Photo courtesy of the U.S. Navy

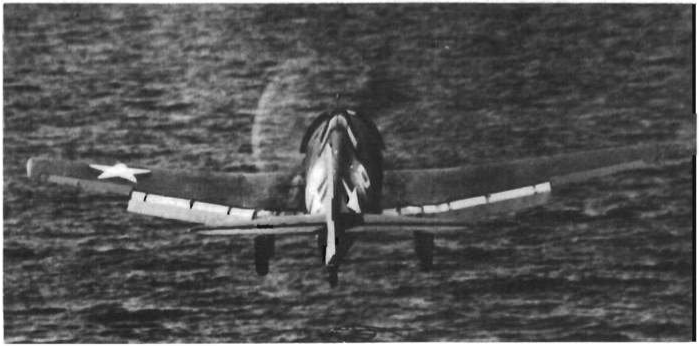
Once you're back on the ground, read the *Historical Background* section of the manual to familiarize yourself with the four major battles you'll be participating in. *Game Play* covers the details of choosing missions, flying, attacking, and winning promotions and medals. Finally, the *Reference Information* section gives you tips on fighter plane maneuvers, dive-bombing and torpedo-bombing tactics, plus more information on the planes you'll be flying and the ships you'll be attacking.

Quick Start Reference

If you're like most game players, you probably want to get a taste of flying without doing a whole lot of reading first. The *Quick Start* instructions let you do just that. In a matter of minutes, you can be flying a U.S. Navy *Wildcat* fighter against eight Japanese *Zero* fighters. Your fuel and ammunition supplies are unlimited, and your mode is invincible, which means you cannot crash or be shot down.

You'll find the *Quick Start* instructions on the Reference Card. For more detailed information on how to start up the game, see *Loading Instructions,* also on your Reference Card.

Photo courtesy of the U.S. Navy



Historical Overview

At the dawn of the year 1942, war was raging in the Pacific, a war thoroughly dominated by the Japanese. Their army and naval forces enjoyed a series of stunning victories, including the sinking of five battleships of the U.S. Pacific Fleet at Pearl Harbor on December 7, 1941. Singapore, the Philippines, the Netherlands East Indies, Guam, and Wake Island fell in rapid succession to the onrushing Japanese, who also pounded northern Australia with numerous air raids. As the Japanese expanded their Pacific territory, the U.S. forces, stung into action by the Pearl Harbor attack, could do little to stop them.

But by the end of that eventful year, Japan and the United States would engage in a series of four epic naval clashes that would decide the fate of the entire Pacific. These battles, the Battle of the Coral

TBF *Avenger* torpedo bombers being lined up for takeoff by deck spotters. *Courtesy of the U.S. Navy*

Sea, the Battle of Midway, the Battle of the Eastern Solomons, and the Battle of the Santa Cruz Islands, all had one factor in common: they were fought primarily by aircraft flying from aircraft carriers. This relatively new type of ship would alter sea warfare forever. For the first time in history, carrier-based fighters, dive bombers, and torpedo bombers would be the principal attack weapons in naval combat.

"Your boys are not going to be sent into foreign wars."

Franklin D. Roosevelt, October 30, 1940, while campaigning in Boston

The Battle of the Coral Sea (May 4 - 10, 1942)

After the capture of the Philippines, Singapore, the Netherlands East Indies, Guam, and Wake Island, the Japanese decided to expand their Pacific holdings even further. With Japanese troops already occupying northwest New Guinea, their plan called for the invasion and capture of Port Moresby, the principal Australian outpost in southeast New Guinea. The loss of this base would cut off the supply route between Australia and the United States, and leave the coast of northeast Australia wide open to invasion. At the same time, Tulagi Island, east of Port Moresby, was to be captured and used as a seaplane base to further isolate Australia.

The antiquated Brewster *Buffalo* fighter planes which guarded Midway were so obsolete that they were unofficially dubbed "Flying Coffins" by those who flew them. After most of them were wiped out in the Japanese attack on Midway, one of the commanders wrote in his action log that "It is my belief that any commander that orders pilots out for combat in an F2A3 *(Brewster Buffalo)* should consider the pilot as lost before leaving the ground."

The U.S. Marine SBU2-3 dive bombers were equally despised. Their official name was the *Vindicators;* their own crews referred to them as "Wind Indicators" and "Vibrators."

The Japanese assembled two task forces. The Carrier Striking Force, led by Vice Admiral Takeo Takagi, left the base at Truk and headed south. This task force included the heavy carriers *Shokaku* and *Zuikaku*, veterans of the attack on Pearl Harbor. The invasion task force, under the command of Rear Admiral Aritomo Goto, was to leave the Japanese

"The sight of those heavy dive-bombers smashing that carrier was so awful I was physically ill."

Lieutenant Commander Jimmy Flatley, describing the attack on the *Shoho* at the Battle of the Coral Sea

base at Rabaul on May 4th and head southwest toward Port Moresby. The light carrier *Shoho,* along with four heavy cruisers, would escort the troop transports as they headed toward New Guinea.

Unknown to the Japanese, however, American intelligence had broken Japan's secret code, and the U.S. forces had learned of the impending invasion of Port Moresby. They also knew that three Japanese carriers would arrive at the Coral Sea, northeast of Australia and southeast of New Guinea, before May 3rd. Two U.S. carrier task forces were assembled, with Rear Admiral Frank J. Fletcher commanding the *Yorktown* task force, and Rear Admiral Aubrey Fitch heading up the *Lexington* group. The carriers *Hornet* and *Enterprise*, under the command of Vice Admiral William F. Halsey, headed south from Pearl Harbor, hoping to reach the other carriers in time to help.

On May 3rd, a Japanese assault force captured Tulagi, which had been abandoned by the Australians. The next day, SBD-3 *Dauntless* dive bombers and TBD *Devastator* torpedo bombers from the *Yorktown* attacked Tulagi Harbor, sinking one Japanese destroyer and three minesweepers. Following this attack, the *Yorktown* met the *Lexington*, and the two task forces headed west through the Coral Sea to engage the Japanese task forces.

Bad weather, poor visibility, and poor scouting kept the opposing fleets from discovering each other right away. At one point they were only seventy miles apart, but each could not find the other. But at dawn on May 7th, search planes from both sides finally made sightings and attacks were launched. The Battle of the Coral Sea had begun.

F4F-3 *Wildcat* fighters, *Dauntless* dive bombers,

In the aftermath of the Battle of the Coral Sea, the carrier *Lexington* was engulfed in an uncontrollable blaze and the order was given to abandon ship. The evacuation was so orderly that not a single life was lost. Even the captain's spaniel, Wags, was saved. The dog, who was wearing a life jacket, was placed in a life raft with other members of the crew.

and *Devastator* torpedo planes from the *Lexington* and *Yorktown* searched for a reported "two carriers and four cruisers." Despite the fact that reconnaissance later reported no carriers in the area, the group pressed on, and at 11 a.m. they found the smaller task force, which was to cover the Port Moresby invasion. There, in the waters below, was an inviting target: the *Shoho.* Although it was protected by a small *Zero* fighter cover, this was not enough to fight off ninety-three American planes. Hit by thirteen bombs and seven torpedoes, the *Shoho* sank in half an hour.

Meanwhile, the *Shokaku* and *Zuikaku*, out of sight of the attacking U.S. planes, launched a strike of their own against what a reconnaissance plane had reported as a carrier and a heavy cruiser. The "cruiser" turned out to be the destroyer *Sims,* which was struck by several bombs and sank. The "carrier" was the tanker *Neosho,* which was badly damaged and had to be scuttled several days later.

Anti-aircraft gunnery drills aboard a U.S. Navy carrier. ***Courtesy of the U.S. Navy***

The next day, May 8th, following a futile night attack on the American task force, a Japanese strike force of thirty-three *Val* dive bombers, eighteen *Kate* torpedo planes, and eighteen escorting *Zeros* took off from the *Shokaku* and *Zuikaku* at 9 a.m. Scout planes had left earlier, the strategy being that if these scouts spotted the American carriers, an attack force would be right behind. At the same time, the *Lexington* and *Yorktown* launched most of their available planes to attack the two big Japanese carriers.

Just as they had done the day before, the two opposing fleets of fighters, dive bombers, and torpedo planes passed each other without sighting the opposition's planes. At 10:30 a.m., the U.S. planes spotted the *Shokaku* and attacked, scoring three bomb hits and severely damaging the heavy carrier. The *Zuikaku*, hidden in a rain squall, escaped detection by the attackers and was able to launch fighter planes to assist the *Shokaku*.

The *Enterprise* under attack by *Val* dive bombers at the Battle of the Santa Cruz Islands. Barely visible in the carrier's wake is the splash from a near-miss. This photograph was taken from a cruiser, whose evasive maneuvers are indicated by the curving wake in the foreground. *Courtesy of the U.S. Navy*

While the American planes were attacking, Japanese scout planes found the U.S. task forces, and the Japanese attack force soon struck. With fighter cover provided by only seventeen *Wildcats* and twenty-three ill-suited *Dauntlesses*, the carriers and their escorting vessels virtually had to defend themselves. On this day, however, Japanese aim was poor. Twisting and turning, the *Yorktown* was able to dodge every torpedo while taking only one bomb hit. The less maneuverable *Lexington* was hit by two torpedoes and two bombs.

Both of the damaged carriers were soon able to recover their returning planes. But when gasoline vapors deep inside the *Lexington* were accidentally ignited by a spark from a generator that had been left running, the carrier was rocked by a tremendous internal explosion. Fires raged out of control, and the *Lexington* was abandoned. Later that evening, it was scuttled by torpedoes from the destroyer *Phelps*.

The Japanese invasion task force, which had reversed its course when the *Shoho* was attacked, was ordered back to Rabaul until the U.S. carriers could be driven off. Thus, the invasion of Port Moresby was postponed. With both the Japanese and American task forces retiring for repairs and refueling, the Battle of the Coral Sea was over. Two historic "firsts" had occurred: a naval battle between aircraft carriers, and a naval battle in which the opposing ships never even saw each other.

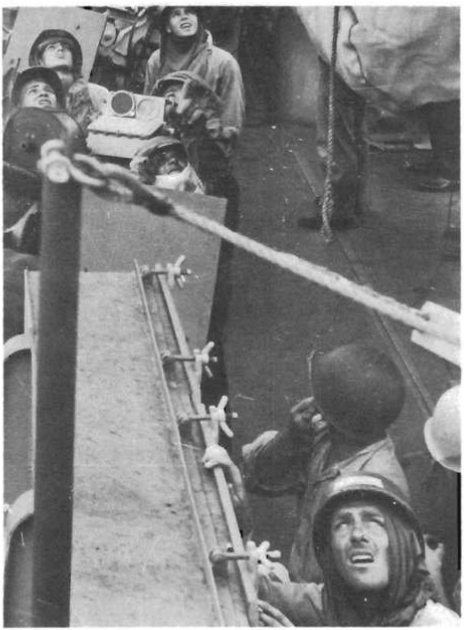
Who won this engagement off New Guinea? Judged strictly on the basis of ships sunk, it was a Japanese victory. The Japanese lost one light carrier plus the services of a heavy carrier, while the U.S. fleet had lost a valuable heavy carrier, a destroyer, and a tanker. But because the losses to the Japanese carriers forced the postponement, and eventual cancellation, of the Port Moresby invasion, the U.S. fleet could claim a strategic victory in the Coral Sea.

This lucky U.S. Navy pilot took a 20 mm cannon shell right through his prop — and lived to tell about it. *Courtesy of the U.S. Navy*

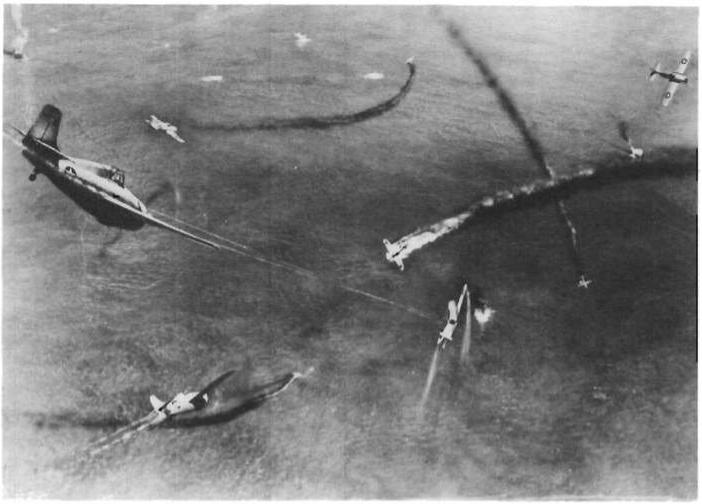
The Battle of Midway (June 4 - 7, 1942)

With a navy vastly superior to the Americans, Admiral Isoroku Yamamoto, Commander in Chief of Japan's Combined Fleet, developed a plan to destroy the U.S. Pacific Fleet once and for all. After a surprise April 18th air raid on Tokyo by American B-25 bombers from the carriers *Hornet* and *Enterprise*, he decided to move up the timetable for this decisive battle.

Yamamoto's plan was to capture U.S.-held Midway Island, and use it as a stepping-stone to take



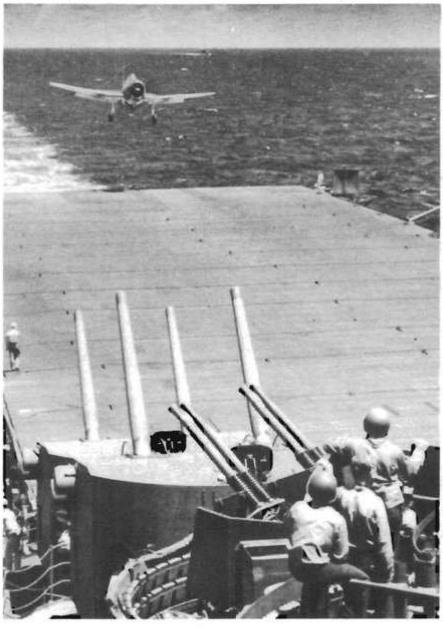
As unidentified aircraft fly overhead, anti-aircraft gun crews of a U.S. Navy cruiser search to see if they're friendly or hostile. ***Courtesy of the U.S. Navy***



Diorama of U.S. Navy F4F *Wildcat* fighters shooting down a Japanese *Kate* at the Battle of Midway. *Courtesy of the Smithsonian Air and Space Museum Library*

over the Hawaiian Islands. To accomplish this, an armada would be sent to Midway to bomb the American base there with carrier planes, and then capture it with five thousand ground troops from twelve troop transports. As a diversionary move, a Japanese task force would head north to the Aleutian Islands. The day before the Midway attack, the U.S. base at Dutch Harbor in the Aleutians would be bombarded, and the islands of Kiska and Attu would be invaded.

Japanese strategy held that the smaller U.S. fleet would immediately sail out of Pearl Harbor when the Aleutians were attacked. It would quickly be spotted by a Japanese submarine curtain outside Pearl Harbor. When the Midway attack commenced, the U.S. fleet would change course to assist the island, where they would be crushed by the superior Japanese fleet. If any U.S. ships still headed for the Aleutians, they



A U.S. Navy fighter gets ready to land. Note the arresting wires on the flight deck. *Courtesy of the U.S. Navy*

would be met halfway by a task force of four Japanese battleships.

But as the Japanese armada steamed toward the east, American intelligence operations, having broken Japan's secret code, learned of the plan to invade Midway. Admiral Chester W. Nimitz, commander of the U.S. Pacific Fleet, ordered Midway to be reinforced, and land-based B-17 bombers were flown in from Hawaii to repel the attack of the invading task forces. The damaged *Yorktown*, believed by the Japanese to have been sunk at Coral Sea, was worked on by fourteen hundred dockyard technicians at Pearl Harbor and repaired in three days, instead of the three months originally estimated. Repairs completed, the *Yorktown* carrier task force, commanded by Rear Admiral Frank J. Fletcher, left Pearl Harbor. The *Enterprise* and *Hornet* carrier task force, commanded by Rear Admiral Raymond A. Spruance in place of the ailing Vice Admiral William F. Halsey, also left Pearl Harbor. When the Japanese submarine barrier arrived, the U.S. Pacific Fleet was already out at sea.

Even with three carriers, the U.S. forces were overmatched by the Japanese. The First Carrier Striking Force, under the command of Vice Admiral Chuichi Nagumo, included the carriers *Akagi, Kaga,*

Hiryu, and *Soryu*, all veterans of the Pearl Harbor attack, plus two battleships, three cruisers, and eleven destroyers. They were without the damaged *Shokaku* and the plane-depleted *Zuikaku*, but Yamamoto felt that his fleet could crush the opposition without the two battle-scarred carriers.

"Scratch one flattop!"

Lieutenant Commander Robert E. Dixon, after his squadron helped sink the carrier *Shoho* at the Battle of the Coral Sea

On June 3rd, U.S. reconnaissance planes, on the alert for the Japanese task forces, finally spotted Vice Admiral Nobutake Kondo's group, which included two battleships, eight heavy cruisers, and the troop transports. B-17 bombers from Midway were sent to attack the fleet, but the high-altitude strikes did no damage to the ships. Later, Japanese planes from the carriers *Ryujo* and *Junyo* attacked Dutch Harbor in the Aleutians.

But Nimitz, along with the American task force commanders, Fletcher and Spruance, refused to fall for the Japanese Aleutians diversion. Their three carriers headed northwest of Midway, where they thought Nagumo's carriers would be.

On the morning of June 4th, the four Japanese carriers launched 108 *Val* dive bombers, *Kate* torpedo bombers, and *Zero* fighters to attack Midway. But as these planes headed for the island, two of the Japanese carriers were spotted by an American reconnaissance plane from Midway. Their position was barely within range of the U.S. carrier aircraft. Spruance now had a decision to make. Should the *Hornet* and *Enterprise* lose valuable time to get closer to the Japanese carriers? Or should they strike now, and hope to catch the carriers when they were the most vulnerable: with the return-

Lieutenant Joichi Tomonaga, commander of the Japanese aerial strike force, returned to the *Hiryu* after the raid on Midway with a punctured left fuel tank. After the *Akagi*, *Kaga*, and *Soryu* were hit by U.S. dive bombers, the *Hiryu*'s planes were ordered to strike. Tomonaga was then informed by the ground crew that the hole in the fuel tank of his *Kate* had not yet been repaired, so that if he left, he would not have enough gas to return to the *Hiryu*. Tomonaga waved the crew off, climbed into his plane, and took off with the rest of the strike, thus displaying the spirit of self-sacrifice that both Japanese and American aviators displayed on that day.

"After Midway we were defensive, trying to hold what we had instead of expanding."

Captain Yasumi Toyama, Chief of Staff of the 2nd Japanese Destroyer Squadron at Midway

ing Midway attack planes refueling and reloading on their decks? Spruance gave the order: attack now.

Back at Midway, a counterattack was launched against the Japanese fleet. A motley assortment of B-17 and B-26 bombers, SBD-3 *Dauntless* and *Vindicator* dive bombers, and TBF-1 *Avenger* torpedo planes all headed for Nagumo's carriers. Midway's fighter cover of six *Wildcats* and twenty antiquated Brewster *Buffalos* also took to the air to protect the island.

When the Japanese attack wave arrived at Midway, most of the American fighter planes were shot down by *Zero* fighters within twenty-five minutes. The installations at Midway were bombed, except for the runway, which the Japanese planned to use after Midway's capture. The counterattacking B-17s, flying high above the Japanese ships and their *Zero* fighter cover, dropped their bombs without any hits, and returned to Midway after the Japanese attack. The six *Avengers*, flying without fighter cover, were sitting ducks for the *Zeros* and only one returned to Midway. Again, no Japanese ships were hit.

But then Admiral Nagumo made a serious mistake. He decided that the harassment from the Midway B-17s and other bombers, which was keeping his task force defense fighters in the air constantly, had to end once and for all. A number of torpedo-loaded bombers had been reserved in case the American fleet was spotted. Nagumo ordered that these planes be immediately rearmed with land bombs to destroy the remaining American planes while they were on the ground at Midway. When this conversion was partially completed, a Japanese scout plane radioed that they had sighted the American carrier fleet. Nagumo temporarily halted the armament switch,

Early in the war, Japanese pilots were far more battle-seasoned than the Americans, since many had flown in the China War. But after Midway, Japan rushed pilots through training, and quality decreased considerably.

then ordered that the land bombs be removed, and replaced with torpedoes.

His indecision proved to be costly. Because while this time-consuming rearming was taking place, the *Enterprise* and *Hornet* had launched every available dive bomber, torpedo bomber, and fighter to engage the carrier force. An hour and a half later, the *Yorktown* launched its planes. The *Hornet*'s dive bombers and fighters failed to locate the carriers, and were forced to turn back, with all of the *Wildcats* eventually running out of fuel and ditching. But the rest flew on, and at 9:25 a.m., the torpedo squadron from the *Hornet*, Torpedo 8, spotted the Japanese fleet.

Flying in the slow, obsolete TBD *Devastators*, with no fighter escort, all three torpedo squadrons were no match for the swarm of *Zero* fighters protecting the carriers. Of the forty-one torpedo planes which attacked, thirty-seven were shot down, and no torpedoes hit any Japanese ship. Every plane from the *Hornet*'s Torpedo 8 was shot down and only one man, Ensign George Gay, survived the onslaught.

So far, the U.S. was faring terribly in the Battle of Midway. A total of ninety-three bombers and torpedo planes had attacked the Japanese fleet — without scoring a single hit. And Nagumo's planes, including those from the earlier Midway strike, were recovered, refueled, rearmed, and ready to be launched against the U.S. carriers. The four carriers started to turn into the wind to launch their planes.

A badly-wounded rear gunner is pulled out of a TBF *Avenger*, which has just landed on the flight deck of the carrier *Saratoga*. He managed to apply a tourniquet to his wounded leg, and remained conscious until help arrived. *Courtesy of the U.S. Navy*

Ensign George Gay was the only survivor of the *Hornet*'s Torpedo 8 squadron. Here, he is shown with members of VT-33, the torpedo squadron he joined after Midway. From left to right: Gay, W.L. Hamilton, Howard Hunt, and F.C. Ashworth. *Courtesy of the U.S. Navy*

Suddenly, from the deck of the *Kaga*, the lookout screamed, "Dive bombers!" While the Japanese fighter cover was busy destroying the low-flying torpedo planes, two squadrons of high-flying *Dauntlesses* from the *Enterprise* were diving on the carriers. With Lieutenant Commander Wade McCluskey leading the way, four bombs ripped the *Kaga*, setting off a chain of explosions as the planes on its deck were ignited. Lieutenant Richard Best's squadron attacked the *Akagi*, and leader Best's bomb was the first to hit the carrier, landing near the bridge. Other hits followed, and soon the *Akagi* was enveloped in flames. Then, Commander Max Leslie's dive bombers from the *Yorktown*, which had caught up with the *Enterprise*'s squadrons, struck the *Soryu*. Three direct hits ignited the planes on the *Soryu*'s deck, and twenty minutes later, its captain ordered the crew to abandon ship.

Six minutes after the first U.S. dive bomber struck, the assault was over, and three Japanese car-

riers were mortally wounded. Ironically, the *Enterprise's* dive bombers had been on their way back to their carrier when they spotted a Japanese destroyer, and followed its course toward Nagumo's carriers. Earlier, they had searched a different area in vain. Another irony: the decks on the *Akagi*, *Kaga*, and *Soryu* were crowded with fueled and armed planes about to be launched. Many bombs were strewn around the deck area while the crews were hastily rearming the planes. When the attack came, it was no wonder that the direct hits on their flight decks quickly turned the three carriers into blazing, exploding infernos. Had the attack come but a few minutes later, the three carriers would have already launched their planes, and perhaps the U.S. carriers would have been sent to the bottom instead of the Japanese.

"We had determined to sink an enemy ship even if we had to ram into her."

Lieutenant Commander Takashi Hashiguchi, recalling the *Hiryu*'s strike against the *Yorktown* at Midway

As the U.S. dive bombers flew off, one Japanese carrier remained untouched. Off in the distance, the *Hiryu* quickly began to launch a strike against the American carriers. Japanese *Val* dive bombers and *Zero* fighters followed some of the *Yorktown*'s planes back to the carrier, and while the *Zeros* engaged the *Yorktown*'s *Wildcat* fighter cover, the *Vals* swooped in. Despite the fact that only seven bombers actually dropped their bombloads, three bombs struck the *Yorktown* and left it dead in the water. No sooner had the damage been brought under control when a wave of *Kate* torpedo bombers attacked the *Yorktown*, scoring two hits. The listing, powerless carrier was soon abandoned by its crew.

Later in the afternoon, American reconnaissance planes located the *Hiryu*, and thirty-eight planes from the *Hornet* and *Enterprise* were launched. As the *Hiryu*'s planes were being readied for a twilight attack on the American carriers,

"A Japanese *Zero* fighter, salvaged in the Aleutian Islands, was brought to the United States. The *Zero* is a stable, easy-to-fly plane with generally good flying characteristics. Its lightness is not gained by flimsy design. The lack of self-sealing tanks and armor protection for the pilot mainly account for its lightness..."

Official Navy Report

the U.S. planes dived out of the setting sun. Four direct hits later, the *Hiryu* was a burning wreck.

As the day ended, four Japanese carriers and one American carrier were dead in the water. The *Soryu* and *Kaga* sank later that evening, while the next morning the *Akagi* and *Hiryu* were scuttled by Japanese destroyers to prevent them from falling into American hands. On the American side, a salvage party boarded the *Yorktown*, and with a towline secured to a minesweeper, the carrier was towed toward Hawaii.

That night, Yamamoto, still hoping to catch the U.S. fleet with his big battleships, continued to sail toward Midway. But the intuitive Spruance decided that the U.S. task forces would not push their luck, and ordered them to sail east, where they would be in a better position to protect Midway from any further attacks.

Early the next morning, there was another engagement between the two sides. The American submarine *Tambor* sighted several Japanese ships and was spotted in return. In the scramble to evade the *Tambor*, however, two Japanese heavy cruisers, the *Mogami* and *Mikuma*, collided. Leaving an oil slick that was easily spotted by American planes, the two ships were later attacked by land-based aircraft, with little damage done. But the next day, planes from the *Hornet* and *Enterprise* attacked the cruisers, sinking the *Mikuma* and badly damaging the *Mogami*.

Following the sinking of the *Shoho* at the Battle of the Coral Sea on May 7th, bombers and torpedo planes from the *Shokaku* and *Zuikaku* were launched with orders to attack the *Lexington* and *Yorktown* at sunset. Failing to locate the American carriers, these planes turned around and headed back to their own carriers. Forty-five minutes after sunset, three of the aircraft spotted the lights of a carrier. They signaled to the vessel in Morse code, were answered, and began to circle the carrier to land. Suddenly, the carrier started firing at them. The pilots quickly realized that they had mistaken the *Yorktown* for one of their own carriers! They immediately flew away from the enemy guns. A few minutes later, three more Japanese planes started circling the *Yorktown*, waiting to land. This time, one was shot down.

On the afternoon of

June 5th, Admiral Yamamoto, with his four carriers now lying on the ocean floor, realized that remaining in the area without air cover would put the rest of his fleet at serious risk. He cancelled the Midway invasion, and ordered his ships to head west.

Meanwhile, the *Yorktown* and its escort ships had been spotted by the Japanese submarine *I168*. Having slipped through a screen of destroyers, the *I168* fired four torpedoes at the *Yorktown*. Two struck the carrier while one hit the destroyer *Hammann*, which was alongside the *Yorktown*. The torpedo broke the *Hammann*'s hull in two, and the destroyer sank within three minutes. The *Yorktown*, now damaged beyond hope of salvage, finally sank on the morning of June 7th.

With the sinking of the *Yorktown*, the Battle of Midway was over. It was a turning point in the war in the Pacific — a victory for a U.S. fleet that sorely needed one six months after Pearl Harbor, and a setback from which Japan would never recover. The loss of 4 carriers, 322 planes, and 3,500 men dealt a severe blow to Japan's hopes of total domination in the Pacific. After Midway, Japan and the United States would be on virtually even terms.

The carrier *Enterprise* was one of the most decorated ships of the Pacific war. Here the "Big E" is shown under attack by *kamikazes*, planes that would deliberately crash on a ship in a suicide attack. *Courtesy of the U.S. Navy*

"Gee, I wish I had just one more bomb!"

Unidentified American pilot during the attack on the Japanese cruisers *Mikuma* and *Mogami* at the battle of Midway

The Battle of the Eastern Solomons (August 24, 1942)

With the victory at Midway, the American strategy for the war in the Pacific changed. Instead of fighting defensive battles, the American Joint Chiefs of Staff decided that a policy of seizing Japanese-held islands for use as forward bases was the best way to push back the Japanese Pacific perimeter.

They agreed that the first Japanese base to be taken would be the newly-established one at Tulagi in the southern Solomon Islands. While scouting Tulagi in July, an American reconnaissance plane reported that an airstrip was being built on Guadalcanal Island, southeast of Tulagi. Orders were given to invade this island, seize the airfield, and prevent the Japanese from establishing air superiority in the region.

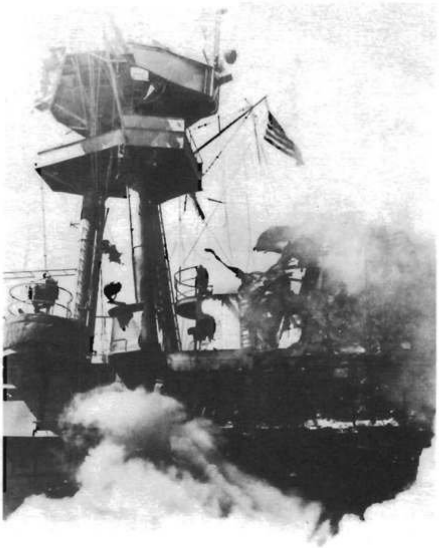
One way to relax between missions was to play a "friendly" game of cards. *Courtesy of Franklin Avery*

On August 7th, U.S. Marines invaded Guadalcanal and Tulagi. Surprising the light Japanese force at the Guadalcanal airstrip, they captured it and renamed it Henderson Field, after a Marine Corps major who died in the Japanese attack on Midway Island. The U.S. Marines encountered much heavier resistance at Tulagi but managed to secure it by August 8th.

From their base at Rabaul, northwest of Guadalcanal, the Japanese sent planes to bomb the new American positions. A naval task force was also dispatched to engage the American surface ships off Guadalcanal. At midnight on August 8th, a surprise Japanese attack, known as the Battle of Savo Island, sank three U.S. cruisers and one Australian cruiser, thus effectively wiping out the support fleet.

For the next two weeks, the U.S. Marines at Henderson Field were largely isolated except for occasional relief from planes and ships when they could get through. Japanese troops, which held the remainder of the island, mounted attack after attack but were repelled by the outnumbered Americans. Every night, Japanese ships sailed uncontested down the straits to the north of Guadalcanal, known as "The Slot," landed troops and supplies, and bombarded the U.S. Marine positions. These raids took place with such regularity that they were nicknamed the "Tokyo Express."

The pilot of this TBF *Avenger*, Commander Henry Howard Caldwell, managed to land his plane on the *Saratoga* with only one wheel of his landing gear, and no flaps, ailerons, or radio. As he climbs out of the cockpit, medical corpsmen remove one wounded and one dead from the shot-up bomber. *Courtesy of the U.S. Navy*



A view of the carrier *Hornet's* signal bridge after a Japane dive bomber crashed into it during the Battle of the Santa Cruz Islands. The flag still flew, but not for long, as the *Hornet* sank later that evening. *Courtesy of the U.S. Navy*

In an attempt to completely wipe out the Americans, a Japanese task force was assembled at Rabaul. The Japanese plan, known as Operation KA, called for the landing of fifteen hundred Japanese troops on Guadalcanal, supported by air and sea bombardments. This task force headed toward Guadalcanal covered by Vice Admiral Nobutake Kondo's group, which included the heavy carriers *Shokaku* and *Zuikaku*, veterans of the Battle of the Coral Sea. Rear Admiral Tadaichi Hara's diversionary task force, which included the light carrier *Ryujo*, steamed south, ahead of the main task force. The Japanese strategy was that if Americans took the bait and attacked the *Ryujo* group, the counterattacking planes from the *Shokaku* and *Zuikaku* would sink the U.S. carriers while their planes were away.

This flurry of Japanese activity at Rabaul was detected by U.S. scout planes and submarines, and the American command guessed that an attack was forthcoming. The American task force, which included the carriers *Enterprise, Saratoga*, and *Wasp*, was ordered to remain south, away from Japanese search planes, to protect the shipping lanes east of Guadalcanal.

On August 23rd, American patrol planes spotted Japanese troop transports heading for Guadalcanal. SBD-3 *Dauntless* dive bombers and TBF-1 *Avenger*

torpedo bombers from the *Saratoga* headed northwest to intercept them. However, the Japanese invasion task force, which had spotted the scout plane, abruptly reversed course, and the U.S. bombers could not locate it. They were forced to land at Henderson Field that night, and rejoined the *Saratoga* the next day.

"Be calm! Nobody is ever wounded twice on the same day."

Winston Churchill

With no definite knowledge of the Japanese task force position and not expecting a battle just yet, Admiral Frank J. Fletcher, commander of the carrier force, dispatched the *Wasp* and its destroyer escorts south for fuel oil. This left only two carriers to engage the Japanese.

The next day, August 24th, the American task force radar picked up Japanese planes headed for Guadalcanal from the *Ryujo*. Thirty scout bombers and eight torpedo planes from the *Saratoga* were launched to search out and attack the carrier. While they were in the air, U.S. scout planes located the *Shokaku* and *Zuikaku* but poor radio reception prevented the *Saratoga*'s planes from hearing the order to attack them. Instead, the *Dauntlesses* found the *Ryujo*, and attacked it with thirty 1,000-pound bombs. Four to ten of these hit home and, following a torpedo attack from the *Avengers,* the *Ryujo* quickly went under.

But it was a loss the Japanese could live with, because the Americans had swallowed the *Ryujo* diversion bait, while the *Shokaku* and *Zuikaku* remained untouched. As the *Ryujo* was being attacked, a Japanese scout plane located the U.S. carriers. Before it was shot down, it radioed the position of the U.S. ships, and soon an attack from the *Shokaku* and *Zuikaku* was launched.

Since U.S. F4F-4 *Wildcat* fighters had downed the

As the *Hornet* prepared for a Japanese attack in the Battle of the Santa Cruz Islands, the galley prepared thousands of mince pies and donuts to serve in the event of a lull in the battle. But as bombs and torpedoes rained down on the *Hornet*, one of the bakers remarked later that "There just wasn't any lull!"

The *Hornet*, a veteran of the Doolittle raid on Tokyo, the Battle of Midway, and the Battle of the Santa Cruz Islands, where it was sunk. ***Courtesy of the U.S. Navy***

scout plane near the carriers, Admiral Fletcher assumed that the Japanese knew their position and would launch an attack. The task force was alerted to this possibility and fifty-three fighters were launched as a defensive screen.

The attack soon materialized. The *Enterprise* and *Saratoga* were ten miles apart, so the Japanese concentrated on the "Big E." Flying through a heavy screen of fighters and anti-aircraft fire, most of the Japanese dive bombers were shot down. Despite the murderous firepower, however, several *Vals* got through to the *Enterprise* and blasted it with three direct hits. Even though explosions ripped holes in the ship's flight deck and jammed the rudder, damage control parties soon had the *Enterprise* fully operational again.

A second wave of attacking Japanese planes was unable to locate the American fleet and had to return to the carriers. Meanwhile, American planes from the *Saratoga* could not locate the Japanese heavy carriers, and instead attacked and damaged a seaplane carrier, the *Chitose*.

As night approached, the American task force

decided to break off the attack and head south. The Japanese task force also sailed south, but at midnight, Admiral Kondo, not wanting to risk his ships in the darkness, ordered them to turn north.

The next day Japanese scout planes unsuccessfully searched for signs of the American task force, which was out of their range. His ships were now low on fuel, so Kondo ordered them back to the base at Truk.

Meanwhile the Japanese transport group was still headed toward Guadalcanal. But *Dauntlesses* from Henderson Field, which had failed to locate the carriers, stumbled upon the transports. Loaded with troops, the *Kinryu Maru* was struck by a bomb, as was the cruiser *Jintsu.* Army B-17 bombers followed this attack and, for the first time in the war, hit and sank a ship, an escorting destroyer. Since it was obvi-

Diorama of the Japanese carriers *Soryu* and *Akagi* under attack by U.S. planes at the Battle of Midway. *Courtesy of the Smithsonian Air and Space Museum Library*

A Japanese bomb blasts the flight deck of the *Enterprise* during the Battle of the Santa Cruz Islands. The photographer who took this picture was killed in the explosion. *Courtesy of the U.S. Navy*

ous that the U.S. controlled the skies over Guadalcanal, the Japanese invasion task force was also called back to Truk.

The Battle of the Eastern Solomons was over, and the outcome was somewhat of a toss-up. The Japanese lost a small carrier, which Yamamoto had anticipated losing, plus numerous carrier aircraft and crews. The U.S. lost the *Enterprise* for two months to repairs. But the U.S. had prevented the Japanese from establishing air superiority over Guadalcanal and had turned back a major troop landing. And the U.S. Marines still held their position at Henderson Field.

The Battle of the Santa Cruz Islands (October 26 - 27, 1942)

"Do not needlessly endanger your lives until I give you the signal."

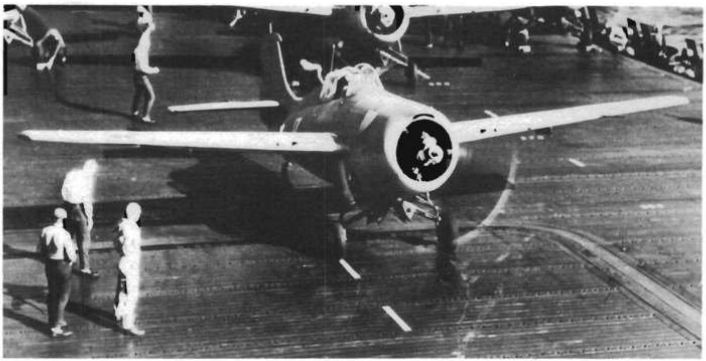
General Dwight D. Eisenhower

As the battle for Guadalcanal dragged on through September and October, 1942, Admiral Isoroku Yamamoto drew up a plan to put an end to the conflict. His strategy called for a naval bombardment of Henderson Field, after which land-based troops would seize the airstrip. Once this was accomplished, carrier-based planes would move in to aid in the offensive and prevent the Americans from landing reinforcements. Additional troops would then be landed on Guadalcanal to drive out any remaining U.S. Marines.

The Japanese carrier task force, including the carriers *Shokaku, Zuikaku, Junyo,* and *Zuiho*, steamed south toward Guadalcanal. On October 23rd, U.S. reconnaissance planes spotted the Japanese ships. Two hastily-assembled carrier groups, led by the *Hornet* and the recently-repaired *Enterprise*, were ordered to a position north of the Santa Cruz Islands, east of Guadalcanal, to intercept the Japanese.

Meanwhile, the Japanese mounted a fierce land- and sea-based attack on the American positions near Henderson Field. Although the devastating naval bombardment destroyed most of the U.S. planes on the airstrip, the Japanese ground troops were unable to overrun the U.S. Marines.

On October 25th and 26th, additional sightings of the four Japanese carriers were made by scout planes. At dawn on October 26th, Vice Admiral William F. Halsey, commander of the South Pacific Force, gave the order to attack. Two SBD-3 *Dauntless* scout/bombers from the *Enterprise* located the Japanese task force and attacked the *Zuiho*. Two bomb hits damaged the carrier, and it was unable to launch or retrieve any more planes. The *Hornet* then launched two waves of attack planes while the *Enterprise* launched another one.



U.S. Navy F4F *Wildcat* readying for take off. *Courtesy of the Smithsonian Air and Space Museum Library*

Unfortunately for the Americans, the *Zuiho* had already launched its planes against the U.S. carriers. A search plane had spotted the *Hornet* earlier, and twenty-seven *Zeros*, twenty-two *Vals*, and eighteen *Kates* from all four Japanese carriers were on their way to the American ships. The first Japanese attack group passed a wave of American F4F-4 *Wildcat* fighters, TBF-1 *Avenger* torpedo bombers, and SBD-3 *Dauntless* dive bombers from the *Enterprise*. In the ensuing skirmish, the *Zeros* shot down three *Wildcats* and four *Avengers* while losing three of their own. The two opposing groups then continued on to their targets.

At 9:10 a.m., the Japanese squadrons found the American carrier groups. With the *Enterprise* hidden by a rain squall, the attackers pounced on the *Hornet*. Although many *Vals* were destroyed by anti-aircraft fire from the *Hornet*, a good number got through, and the carrier was ripped by four bomb hits and a deliberate suicide crash by a damaged *Val*. Two torpedoes from the attacking *Kates* plus another suicide crash completed the damage, and the *Hornet* was left listing and in flames.

While the *Hornet* was under attack, its planes, along with those from the *Enterprise*, were unleashing a similar attack on the Japanese carriers. The American *Dauntlesses,* noting that the *Zuiho* was already damaged from the earlier strike, concentrated on the *Shokaku*. Three to six 1,000-pound bombs rocked the carrier and destroyed its flight deck, ending any further flight operations. Other planes attacked secondary targets in the task force and heavily damaged the cruiser *Chikuma*.

Back at the American task force, an attacking Japanese submarine torpedoed the destroyer *Porter*, which later had to be sunk by the Americans. Then a second Japanese wave from the *Shokaku* and *Zuikaku* struck. First came the *Val* dive bombers, flying straight into the murderous anti-aircraft fire from the *Enterprise* and the battleship *South Dakota*, which was later credited with twenty-six kills. But the *Vals* still managed to damage the *Enterprise* with three bomb hits. Next came the *Kate* torpedo bombers, launching four torpedoes that the *Enterprise* was able to avoid. Another wave from the *Junyo* damaged the *South Dakota* and the cruiser *San Juan*.

In the wake of these attacks, the *Enterprise* was still operational and proceeded to recover its planes. On the dead-in-the-water *Hornet*, however, salvage crews were trying to tow the carrier when a wave of Japanese torpedo bombers and dive bombers from the undamaged *Zuikaku* and *Junyo* struck. The *Hornet* was hit by a torpedo and

"...a little beer bottle of a plane."

Pilot's description of the F4F *Wildcat*

"Seven minutes after the plane hit the water, it turned over and the fire went out. There was gasoline all over the water. Diving for the life raft, I got some on my hands, in my eyes, and I swallowed a little. It made me sick immediately.

"On one dive, I caught my life jacket on the plane and ripped one side. The other half kept me up for a while, but scratches turned into slow leaks. Before long, I threw it away.

"The life raft, by good fortune, inflated perfectly. My radioman had bought a two gallon canteen in Honolulu and kept it full of fresh water on the plane. We paddled away from the sinking wreckage slowly. We risked being spotted by the enemy, but it was the only way of being seen by our own boys..."

Bureau of Aeronautics Newsletter
December 1, 1942

A U.S. Navy F4F-4 *Wildcat* fighter being catapult-launched. *Courtesy of the U.S. Navy*

two bombs, and the order was given to abandon ship.

With the Japanese fleet drawing nearer, the destroyers *Mustin* and *Anderson* were given the task of scuttling the *Hornet*. But even after taking nine hits from American torpedoes, the *Hornet* would not sink. The destroyers then fired four hundred and thirty rounds into the carrier and soon it was a floating inferno. When Japanese reconnaissance planes began dropping flares on the scene, the American destroyers fled. Later a Japanese destroyer division arrived, and fired four more torpedoes into the *Hornet*, sending it to the bottom.

In terms of combat tonnage lost, the Battle of the Santa Cruz Islands was a Japanese victory. The loss of the *Hornet* left the damaged *Enterprise* as the only functioning carrier in the Pacific. Tactically, however, the U.S. gained the edge in battle. With two carriers damaged, and many aircraft and crews lost, the Japanese task force had to turn back and head for

their base at Truk. And yet another attempt to drive the U.S. Marines from Guadalcanal had failed. Four months later, the Japanese would concede defeat and pull their remaining troops from Guadalcanal, the "Island of Death." For the next two and a half years, they would continue to fight a long, bloody series of defensive battles until September 2, 1945, when Japan would officially surrender to the United States.

"A bit of shooting takes your mind off your troubles."

Brendan Behan

Game Play

Loading Instructions

Remove the *Battlehawks* floppy disk from the sleeve at the back of the book, then look at the Reference Card. There, you'll find instructions on how to load *Battlehawks* from a floppy disk, install it on a hard disk, and start up the program. When you have finished, refer back to the *Menu Choices* section of the manual below.

Menu Choices

Once you've loaded the *Battlehawks* disk, you'll be at the first of several menus. Here's how to move through all your menu choices, including reviewing planes, selecting missions, and keeping track of your pilot records.

How to Select from the Choices on the Screen

From now on, we'll refer to your cursor keys, mouse, or joystick as "the controller."

At many points in the game, you'll see a display of your current options with one option highlighted in a bright color. You can move this highlight from one choice to another by moving your controller in the appropriate direction, or by pressing the correct keys (see *Keyboard Reference*). Then, to actually choose the highlighted selection and move on to the next screen, press **RETURN** (or press and release your controller button).

Dive bomber pilot Lieutenant Clarence Avery in his SBD *Dauntless*. Bombs painted on the side of the fuselage indicate the number of missions flown. *Courtesy of Franklin Avery*

Game Start

Press any key or button to move through the title screen and the credits to the Main Menu.

Main Menu

You'll know you've reached the Main Menu when you see a screen with a close-up of an American *Wildcat* fighter plane on the deck of a carrier. There will be five menu choices:

Select Training Allows you to choose a Training mission, which will not reflect on your Service Record.

Select Active Duty Allows you to choose an Active Duty mission that will count on your Service Record.

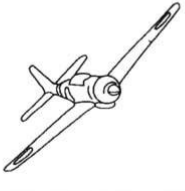
The carrier *Enterprise* lies burning in the water following a dive-bombing attack. *Courtesy of the U.S. Navy*

Review Planes Allows you to inspect the different Japanese and American aircraft you can fly in *Battlehawks*.

Review Service Records Allows you to inspect and manage the records of all pilots. You'll automatically start the game with a default American pilot named TRAINEE. If you want to use a different pilot, or start with a new one, you must choose this option before your first Active Duty mission.

Exit from Program Allows you to leave the game.

YAMAMOTO



Training Missions

Here's where you can develop, practice, and improve the skills that can help you perform well in your Active Duty missions. Since none of the results of these Training missions will appear in your Service Record, we encourage you to take chances and make mistakes when flying them. It's the best way to become a better pilot in actual combat situations.

Once you have chosen a Training mission, you will move to the Ready Room screen, where you can make modifications to your mission. Experiment with as many different modifications as you can.

You'll have four types of Training missions to choose from:

Fighter Intercept You'll attack incoming enemy planes with your fighter. You must defend your ship by shooting down enemy bombers or their fighter escorts before they can attack.

Fighter Escort You'll fly a fighter and defend friendly aircraft as they attack enemy ships. With enemy fighters everywhere, your fellow pilots will need all the protection you can give them.

Dive-Bombing You'll drop your bomb load on an enemy ship. Dive bombers flew at high altitudes, then plunged almost straight down, releasing their bomb and pulling out close over their targets. Depending on your mission, you may face enemy fighter opposition. For more information, see the section on *Aerial Tactics and Tips.*

Japanese aircraft radios were quite ineffective and were never used in combat. Except in ideal conditions, static overwhelmed the communications. Pilots resorted to hand signals and blackboard messages between aircraft.

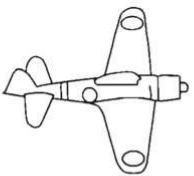
Torpedo-Bombing You'll fly a hazardous torpedo run. The low-flying torpedo bombers had to practically skim the waves to launch their torpedo — and to avoid being detected by the enemy. Fly low and slow toward the enemy ship, and drop your torpedo when you're close. Enemy fighters may be in the area. Techniques of torpedo-bombing are discussed in *Aerial Tactics and Tips.*

SBD *Dauntless* dive bomber pilot, holding his plotting chart. This navigation board slid under the instrument panel, and held information about the code for the day, plus the estimated position of the pilot's carrier in four hours. *Courtesy of Franklin Avery*

Exit This returns you to the Main Menu.

To select one of these Training missions, move your controller up and down until the type of mission you want to fly is highlighted. Next, move your controller right to view the different scenarios for that type of mission, then left to view them again. The first scenarios are the easiest, and you may face little or no opposition. As you continue to move the controller to the right, the scenarios will become more and more difficult.

CARRIER



Active Duty Missions

These are the ones that count! Success in your Active Duty missions will be rewarded with promotions and medals, which will be logged in your Service Record. But failure to execute your mission correctly will also be recorded.

And remember — in 1942, many pilots did not make it back to their ships. These missions can be hazardous!

When you move to the Active Duty missions screen, the name and nationality of your current pilot is displayed at the top. With the original pilot, TRAINEE, you won't be able to save your Service Record. If you want to change the pilot, select EXIT, then select REVIEW SERVICE RECORDS from the Main Menu. (For more information, see the *Review Service Records* section of this manual.)

Unlike American pilots, who were officers, most Japanese pilots were enlisted men. Officers led formations, but the enlisted men did most of the fighting — and accounted for most of the casualities.

To start your Active Duty mission, choose one of the battles shown on your screen. Then, move your controller right to view the various missions you can fly, then left to look them over again. These missions will vary, depending on the battle you've chosen, and the nationality of your pilot. You may select the missions in any order, but you must complete all the missions in a given battle to qualify for top honors.

On the menu screen, you'll see the following four battle choices:

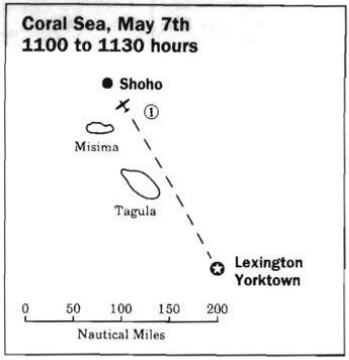
The Battle of the Coral Sea A duel of the flattops, where for the first time a naval battle was fought entirely with air power. The Americans lost more ships, but won the more important victory of preventing a Japanese invasion. This time, the outcome is up to you.

The Battle of Midway The pivotal battle of 1942, perhaps of the whole Pacific war. When it was over, four Japanese carriers were at the bottom of the sea. Can you recreate history — or change it?

The Battle of the Eastern Solomons The Japanese want to land troops on the island of Guadalcanal. The Americans want to stop them. Historically, it was a trade-off in ships, but a strategic victory for the Americans because the Japanese invasion fleet turned back. Now, it's in your hands.

The Battle of the Santa Cruz Islands The last major carrier battle of 1942. A victory here, and the Japanese could still dominate the Pacific theater. Will you give the Empire of the Rising Sun new hope — or stop it cold?

Exit This returns you to the Main Menu.



In each of these battles, you can experience the same situation from both sides of the battle. The composition of the forces may not be precisely the same for each side, as exciting situations were chosen to maximize each side's challenge.

After you've chosen one of these battles, move your controller right to view your mission choices, then left to see them a second time. Remember, to distinguish yourself in combat, you're encouraged to fly all the missions in a given battle.

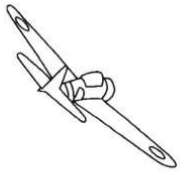
Battle of the Coral Sea: Mission Choices

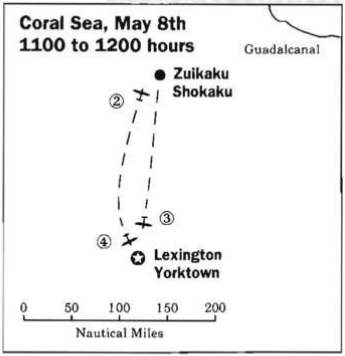
① **U.S.** Fly one of several SBD *Dauntlesses* launched from the carrier *Lexington* in a dive-bombing attack on the damaged and burning light carrier *Shoho*. Enemy fighter cover is expected. (In the actual battle, the *Shoho* was sunk.)

① **Japan** Fly a *Zero* fighter on an intercept mission to protect the *Shoho* from approaching U.S. dive bombers.

② **U.S.** You're in a F4F *Wildcat* fighter, escorting a group of dive bombers in their attack on the *Shokaku*, a heavy carrier. An aggressive CAP (Com-

INFAMY





bat Air Patrol) of *Zeros* will try to protect the carrier. (In this action, the *Shokaku* was damaged and had to sit out the Battle of Midway.)

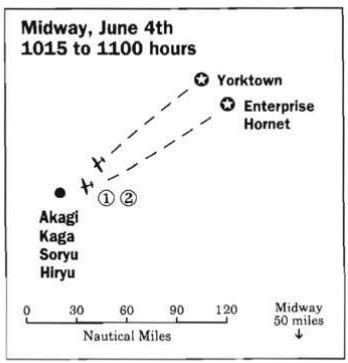
② **Japan** You and your *Zero* fighter must intercept the approaching American air strike and save the *Shokaku*, an honored veteran of the Pearl Harbor attack.

③ **U.S.** You're on the defensive in your *Wildcat* as a group of *Kate* torpedo bombers, escorted by *Zero* fighters, closes in to attack. Concentrate on the *Kates,* and don't let them get through to the *Lexington*. (Historically, this attack succeeded and the *Lexington* sank soon after.)

③ **Japan** Recreate history in your *Kate* torpedo bomber by attacking and sinking the carrier *Lexington*.

④ **U.S.** Defend the *Yorktown* from attacking Japanese *Val* dive bombers. You'll have to move your *Wildcat* quickly to save the carrier. (The *Yorktown* was damaged in the actual battle, but was repaired in record time at Pearl Harbor, and went on to play an important part in the Midway battle.)

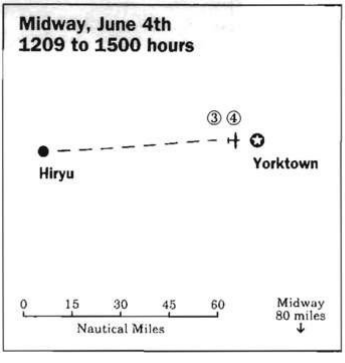
④ **Japan** Try to change history by dive-bombing the *Yorktown* into oblivion with your *Val.* Enemy fighter cover is present.



Battle of Midway: Mission Choices

① **U.S.** You fly a *Dauntless* dive bomber as the wing man for Lieutenant Dick Best as he makes his run on the carrier *Akagi*. Enemy fighters (CAP) are at low level, having just devastated the

American torpedo planes. Follow Lt. Best in and drop your bomb on the carrier. (Historically, both bombs hit, and Lt. Best went on to become one of the first heroes of the war, and later the *Battlehawks* technical advisor.)



① **Japan** Perhaps the most critical minutes of the entire war for the Japanese! You and your *Zero* must intercept the numerous American bombers attacking your carriers. Honor the Emperor, and rewrite history.

② **U.S.** The carriers *Akagi*, *Kaga*, and *Soryu* are damaged. Your squadron of *Dauntless* dive bombers can help send them to the bottom, or seek out and destroy the carrier *Hiryu*. (In the actual battle, the *Hiryu* was not attacked in the first dive-bombing strike, and launched a strike of its own against the *Yorktown*.)

② **Japan** Protect the *Hiryu* from the attacking Americans. Only your *Zero* can save the carrier so it can launch a counterstrike.

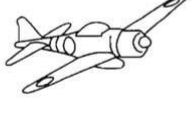
③ **U.S.** The tables are turned as you pilot a *Wildcat* in defense of the *Yorktown*. Stop the *Vals* that are attacking in great numbers. (In this action at Midway, the *Yorktown* was heavily damaged.)

③ **Japan** You and your *Val* represent a chance to avenge your fallen comrades. Dive-bomb the *Yorktown* and sink it!

④ **U.S.** One last chance to save the *Yorktown*. The *Val* attack has damaged the carrier, and the follow-up attack is a squadron of *Kate* torpedo bombers. Pilot your *Wildcat* skillfully and you may prevent the *Yorktown*'s historical fate.

④ **Japan** Use your powerful "Long Lance" torpedo to send the *Yorktown* to the bottom. You must pilot your *Kate* through the heavy enemy CAP that protects your target.

RABAUL



Battle of the Eastern Solomons: Mission Choices

① **U.S.** Your TBF *Avenger* packs a powerful punch. If you can deliver its torpedo to the carrier *Ryujo*, you may repeat history and sink it.

① **Japan** Fly your *Zero* with distinction, and the *Ryujo* can live to fight again.

② **U.S.** Attacking Japanese planes threaten the *Enterprise*. You fly a *Wildcat* in CAP to protect the carrier. The attack is fierce, and it will take every bit of skill and daring you can muster. (Historically, the *Enterprise* was damaged but survived.)

② **Japan** Try to turn the tables on the U.S. forces by sinking the *Enterprise*. You fly a *Zero*, escorting some *Val* dive bombers.

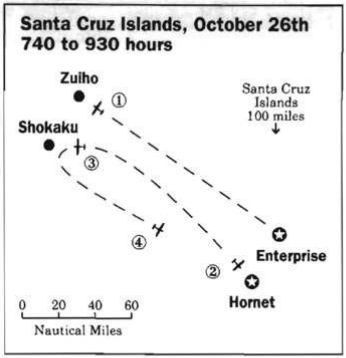
③ **U.S.** You've dropped your torpedo on the *Ryujo* and your home carrier is in sight. But the battle isn't over. You'll have to fly your *Avenger* as a fighter when you encounter a flight of Japanese bombers returning from their attack on the *Enterprise*.

③ **Japan** It's an unusual match. Will the superior maneuverability of your *Val* let you outfight the slow but tough and well-armed *Avenger*? Remember, you both have tail guns!

④ **U.S.** Fly your unescorted *Dauntless* in a strike against the well-protected Japanese Support Group ships. There are no carriers, so pick out a cruiser and dive in.

④ **Japan** You're lucky enough to be flying CAP in your *Zero* over several cruisers and a seaplane carrier of the Support Group when enemy dive bombers make their appearance. Save the ships!

Battle of the Santa Cruz Islands: Mission Choices



① **U.S.** Your scouting *Dauntless* has spotted the main Japanese force's carriers. Attack despite the heavy CAP resistance, and you may better the inconclusive historical results.

① **Japan** Bring down the enemy dive bombers with your *Zero* before they can reach your carriers. Be sure to watch out for their tail gunners.

② **U.S.** Fly CAP in your *Wildcat,* and protect the *Hornet* from a combined attack of *Vals* and *Kates.* (In the actual battle, this proved to be too great a challenge and the *Hornet* was badly damaged, and later sank.)

② **Japan** Your *Kate* torpedo bomber is to attack the *Hornet* in concert with a *Val* dive-bombing attack. Your torpedo carries a deadly punch, but the American fighter cover and anti-aircraft fire offer a strong defense.

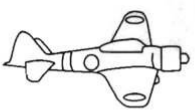
③ **U.S.** Fly your *Avenger* torpedo bomber in an attack against your old nemesis, the *Shokaku.* The carrier is well-protected, but with courage and luck, you could sink it. (In 1942, the *Shokaku* was badly damaged in the attack and knocked out of action for nine months.)

③ **Japan** Save the *Shokaku* with your *Zero,* and air superiority in the Pacific may again belong to the Empire of the Rising Sun.

④ **U.S.** A difficult *Wildcat* fighter mission unfolds as you escort damaged torpedo bombers home. You must pass through a gauntlet of *Zeros* eager for a chance to even the score.

④ **Japan** Your last chance for an honorable victory! Fly your *Zero* like a *samurai,* and pick off the enemy torpedo bombers and their fighter escort.

HELLCAT



Review Service Records

The menu choice REVIEW SERVICE RECORDS lets you look over and modify the records of current and previous pilots who have flown *Battlehawks* missions. The name and nationality of your current pilot are shown at the top of the screen.

If you're playing from a floppy disk, you'll be asked to insert a Service Record disk to save your records on. If you don't have one yet, insert a formatted disk and use the PREPARE DISK command described below. As you move the highlight up and down through the menu choices, specific instructions on how to use them will be displayed on the screen.

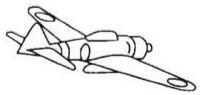
These are the selections you'll see on the screen:

Select Pilot This lets you choose one pilot from the list of current ones to become your active pilot. You need to do this before starting on any Active Duty missions that you want to record.

Rear Admiral Raymond Spruance, who took over for the popular Vice Admiral William F. Halsey before Midway, was a different type of leader, as his staff soon found out. Every day, he would make exactly two cups of coffee from his own green coffee beans which he brought with him. Then, he would ask a member of his staff to join him. Eventually, his staff drew lots, with the loser drinking coffee with Spruance. They did this not because they hated the admiral, but because they hated his coffee.

When you boot up the program, a preselected American will be your current pilot. This pilot will be named TRAINEE, and will also appear whenever you delete your current pilot. If you fly any mission with TRAINEE as your pilot, that Service Record cannot be saved. Enter your own pilot name and nationality when you want to save the results of a mission. The nationality of the pilot will determine which side you fight on.

SPRUANCE



You may select a pilot that has been grounded, retired, or killed in action (KIA) if you want to review his record. This pilot cannot fly any more missions.

New Pilot This allows you to enter a new name on the list of pilots, and select his nationality.

View Record This displays the battle history of the selected pilot. Medals are shown in the cases on the

"He wanted officers who would push the fight with the Japanese. If they would not do so, they were sent elsewhere."

Rear Admiral Raymond Spruance, describing his boss, Admiral Chester W. Nimitz

lower part of the screen. See the *Medals and Promotions* section for more information on these.

The battle history keeps track of victorious missions as well as a count of defeated enemy planes and ships. Each small ship and aircraft symbol stands for one ship or plane destroyed; each large symbol stands for five. The number of planes your pilot has lost is also shown. If a pilot loses ten planes, he'll be grounded, unable to fly again. After sixteen missions he'll be retired, and can live out his life as a genuine World War II hero.

Rename This lets you change the name of an existing pilot.

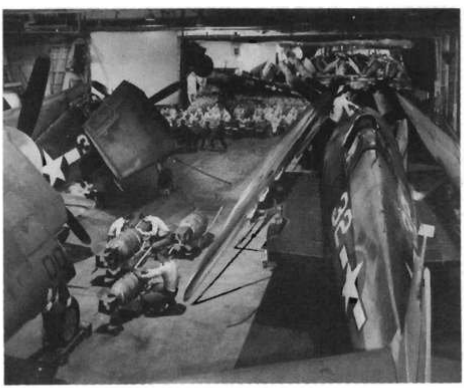
Delete Use this to remove a pilot from the list.

Prepare Disk Use this on a formatted floppy to set it up as a Service Record disk.

Best Career Choose this to display a list of the pilots with the all-time best combat careers.

Best Mission Choose this to display a list of the all-time best single missions pilots have flown, regardless of their total career record.

Exit This sends you back to the Main Menu.



Planes being loaded with bombs on the hangar deck of a U.S. Navy carrier. In the background, off-duty men can be seen watching a movie. ***Courtesy of the U.S. Navy***

Ready Room

Once you have chosen a mission, you'll be sent to the Ready Room. There, you'll get your mission briefing. You can modify your missions in the Ready Room, but if you modify Active Duty missions there, they will NOT count on your record. The blackboard in the center of the screen describes your new mission. The indicator boxes along the top show those characteristics of your mission that you can modify. From left to right, they are: PLANE MODEL, AMMUNITION/FUEL/DAMAGE LEVELS, STARTING ALTITUDE, and ENEMY SKILL LEVEL.

You can change these mission settings by selecting MODIFY PLANE. When you do, the briefing will be replaced by a list of options. Move the highlight through the options, and make your selections. As you press **RETURN** (or your controller button), you will change the settings. These changes will be displayed in the corresponding box at the top of the blackboard.

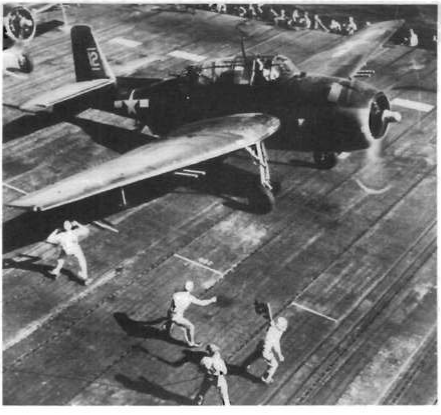
Japanese pilots were fed much more lavishly than ordinary sailors. In addition to ample portions of fish, pork and rabbit, they were given daily vitamin supplements.

Here are your choices:

Plane Model Use this to change to a different model of aircraft. You'll retain the current type of plane (FIGHTER/DIVE BOMBER/TORPEDO BOMBER), but you can try newer or older models of that plane which might have been on a Japanese or American carrier in 1942. In Active Duty missions, if you want to fly planes of a different nationality, you must register as a pilot of that nationality. (See the section on *Review Service Records*.)

CRUISER

Ammunition Use this to change between STANDARD or UNLIMITED amounts of ammunition. In the STANDARD mode, you'll carry the same amount of ammunition as the planes in 1942 did (see *Reference Information* for data on ammunition loads). In the UNLIMITED mode, you'll never run out of ammunition.



TBF *Avenger* torpedo bombers taking off for an attack on the island of Saipan. *Courtesy of the U.S. Navy*

Fuel Use this to choose between STANDARD (picture of fuel gauge) or UNLIMITED amounts of fuel. STANDARD is the amount of fuel that planes in 1942 carried. Since *Battlehawks* concentrates on the combat part of a flight mission, there is often little chance of running out of gas, even at the STANDARD fuel setting. If you're low on fuel, you can decrease your fuel consumption by cutting back on the throttle (see *Keyboard Reference*).

Plane Damage Levels With this, you can change between STANDARD and INVINCIBLE modes. STANDARD is the normal amount of damage that can be sustained by that plane, and INVINCIBLE lets your plane take an endless amount of damage, so you can't crash or be shot down. In the INVINCIBLE mode, you'll never hit the water.

Starting Altitude This gives you a choice of altitudes from which you can begin your mission. (In general, starting a few thousand feet higher than your enemies gives you an advantage.)

Enemy Skill Level With this setting, you can select the skill level of your enemies. In increasing order, these levels are CADET, VETERAN, and ACE. (Since the Japanese did not acknowledge aces by numbers of planes shot down, the ACE skill level is used here to denote top-quality pilots.)

Reset All Values This restores the values for this mission to the default settings, or the settings that initially appear in the Ready Room. IMPORTANT: If you change ANY values for an Active Duty mission, it

will not be recorded in your Service Record. Only valid, historically-accurate missions are counted. For this reason, if you decide you don't want to change any values after all, use this option.

Exit This drops you back to the selections at the bottom of the screen. Use this when you're finished with your modifications.

Other Ready Room commands are:

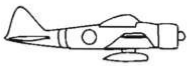
Begin Flight Select this only when you're ready to begin your mission. When you do, you'll be given a recognition/password test, and then sent to the skies.

New Mission If you decide you don't like your current mission after seeing the briefing, use this command to return to the mission selection screen.

Exit to Main This lets you leave the Ready Room, and return to the Main Menu.

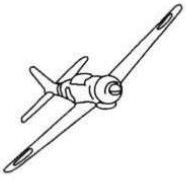
As the mortally-wounded Japanese carrier *Soryu* was being abandoned by its crew, they noticed that the captain, Ryusaku Yanagimoto, was not boarding any of the rescuing destroyers. Fearing that their beloved captain meant to go down with his ship, Chief Petty Office Abe, a navy wrestling champion, was sent to bring him down from his tower, willingly or unwillingly. After saluting the captain, Abe asked him to accompany him to safety. The captain stared straight ahead, as though he had not heard him. Abe moved toward him to pick him up, when the captain turned slowly around and stared at Abe. His gaze stopped Abe cold. With tears in his eyes, Abe then saluted the captain and left the tower.

FLETCHER



Recognition Test

This is your final step before take off. The Flight Deck Officer will show you a silhouette of a *Zero* fighter. Turn to the *Loading Instructions* and following sections of your *Battlehawks* manual, and look for the matching illustration in the bottom, right-hand corner of one of the pages. When you find it, enter the corresponding password with your keyboard, and press **RETURN** (or your controller button). For example, if the silhouette is:



you should find it on the first page of *Main Menu* with the corresponding password *YAMAMOTO*. Type in:

YAMAMOTO

and press **RETURN** (or your controller button).

This test is an important part of pre-flight preparation. Take your time, and be careful when you compare the picture on the screen to the one in the manual. If you make a mistake in recognition, you'll be judged unready for advanced combat duty and sent to a basic training mission.

Cockpit View

You always start your mission inside the cockpit of your aircraft. Here are the instruments you'll see in front of you:

1. Speed Brakes (SBD *Dauntless* only) This indicates the position of your speed brakes. *Down* is open, *up* is closed. Use your speed brakes to slow your dive bomber while diving on a target.

2. Flaps This gives you the position of your flaps. *Up* means flaps up, *down* means flaps down. Put your flaps down to lower your stalling speed, so you can fly slower without stalling (useful in torpedo runs). Otherwise, fly with your flaps up for greater speed.

> **"Our SBD *Dauntlesses* could really take it. There were a number of cases where planes would come back with a lot of holes in them, wheels gone, wings shot up, but they'd still fly home." *U.S. Navy Flyer***

3. Landing Gear This shows you the position of your landing gear. In the *Val* dive bomber, the landing gear is always down. Lowering your landing gear can slow you down slightly by increasing drag.

4. Name This indicates the name and model of your aircraft.

5. Airspeed Indicator This reads in hundreds of miles per hour, so 2 is 200 MPH. Stalling speed is about 70 MPH with the flaps up.

6. Climb/Dive Indicator This dial shows how fast you're gaining or losing altitude. The positive readings at the top show a climb, the negative ones at the bottom show a dive. All readings are in thousands of feet per minute.

7. RPM Indicator This shows your throttle setting in revolutions per minute. The higher the setting, the farther to the right this indicator goes. The red area warns you when you're using fuel at a high rate.

8. Camera Indicator This red light comes on when your replay camera is recording (see *Keyboard Reference* for details on how to control the camera). Use this feature to record and replay the events happening around you. While you're watching your replay,

FLATTOP

"I didn't keep very good files; I carried it all in my head."

Commander Joseph Rochefort, the man who broke the Japanese code

you can use your controller to move your point of view all around the sky. The replay camera is an excellent tool for learning flight tactics, as well as a way to enjoy the game from a movie-like perspective.

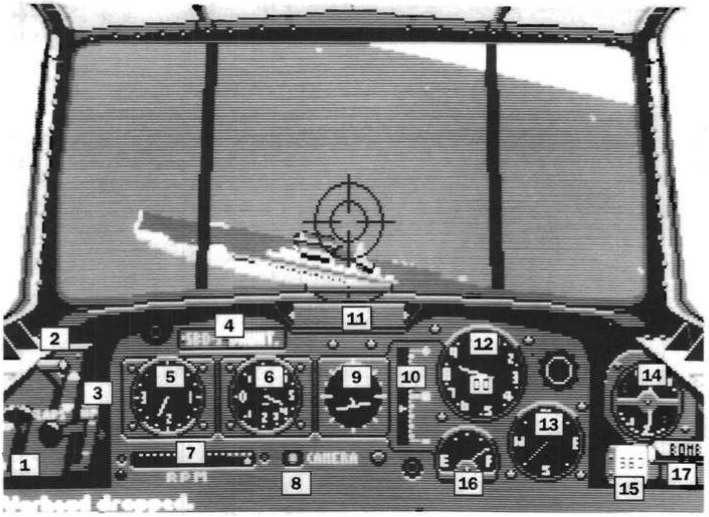
9. Banking Indicator This dial shows the roll of your plane. (See the *Flight Fundamentals* section for an explanation of *roll.*) When you're flying with your wings level, the indicator will display a straight horizontal line with a small vertical bar to show which way your tail points. As you bank to the left or right, the indicator will change to show your orientation.

10. Pitch Indicator This shows how far above or below the horizon the nose of your plane is pointing. The + direction is up, *o* is level, and - is down.

11. View Info This small panel serves several functions. When you're in normal forward flight, it is blank. On some computers, RIGHT, LEFT, DOWN, or REAR will be displayed when you look out your cockpit window in those directions. Your screen will also display the corresponding view from the cockpit. (See *Keyboard Reference* for information about looking out your cockpit.) Other computers will show you these views through the appropriate side or rear window.

VIEW INFO can also be used in the SCAN mode to let you look around in any direction, using your controller to move your point of view. In this mode, the VIEW INFO panel shows two numbers. The first indicates how many degrees up or down you're looking. It ranges from -90 degrees (straight down), through 0 (horizon level), up to +90 degrees (straight up). The second number shows the direction you're looking, relative to your line of travel. If you're looking to the right, it goes from 0 degrees (straight ahead), through +90 degrees (directly to the right), to +180 degrees (behind you). If you're looking to the left, it goes from 0 degrees (straight ahead), through -90 degrees (straight left), to -179 degrees (nearly straight behind you).

In the replay camera mode, REPLAY will be dis-



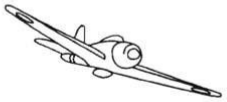
played here (see the *Keyboard Reference* section for instructions on using the replay camera).

12. Altimeter This dial shows your altitude in feet. The digital display on the dial shows thousands of feet, the little hand hundreds of feet, and the big hand tens of feet. For example, if the digital display reads *02*, the little hand is on the *6*, and the big hand is midway between *1* and *2*, your altitude is 2,615 feet.

13. Compass This indicates which direction you're heading: north, south, east, or west.

14. Engine/Airframe Damage Counters These twin dials show the total damage to the engine (top dial) and the airframe (bottom dial). Severe damage to either the engine or the airframe will push the indicators over into the red. If that happens, you're likely to

CACTUS



completely lose engine power or lose control of your aircraft. Your only option will be to bail out.

15. Gun Rounds This indicator shows how many rounds of ammunition are left in your forward-pointing gun. The Japanese *Zero* fighter has two indicators here. The top one shows the number of rounds in your 7.7 mm machine guns, and the bottom one indicates the number of rounds in your more powerful 20 mm cannon.

When you're flying dive bombers or torpedo bombers, an indicator in the rear view shows how many rounds are left in the rear machine gun.

16. Fuel Gauge This gauge shows how much fuel you have: *E* means empty, *F* means full.

17. Warhead Release This shows if you have a warhead (torpedo or bomb) to release. Fighter planes never carry warheads in *Battlehawks*.

Photo courtesy of the U.S. Navy

Leaving the Game

To exit the *Battlehawks* program directly to your computer's operating system, you may press the **ESCAPE** key any time you are not in the cockpit. From the in-flight, cockpit view, you must press:

q

first to quit, then **ESCAPE** to exit.

Keyboard/Mouse/Joystick

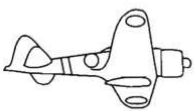
To find out which of these controllers is supported by your machine, please see your Reference Card.

For players without a mouse or a joystick, the keyboard will control all of the game features. However, we strongly recommend that you use either a joystick or a mouse as your primary flight controller. The joystick will give the most "true to life" control and is easier to use for loop maneuvers. The mouse gives the smoothest fine control. In any case, the cursor keys (arrow keys) can function as the controller.

In this section, the mouse, joystick, and cursor keys will be referred to collectively as *the controller*. Buttons on the mouse or joystick will be referred to as *controller buttons*. In the menu screens (all screens except the cockpit views, which are the ones you'll see in-flight), the controller allows you to move up, down, right, and left through the menu choices.

If you have a non-standard mouse or joystick, you may be confused about which of your buttons are the ones referred to in the manual as *left button* or *right button*. Here's a simple way to find out. Fly a fighter intercept training mission, and select a Japanese *Zero* fighter and STANDARD ammunition (not UNLIMITED). Once you're in the cockpit, look at the GUN ROUNDS display (item 15 in the cockpit illustration on page 64). When you press one button on your controller, the top number will decrease. This button is the one referred to as the *left button*. A different button will make the bottom number decrease. On a dive-bombing or torpedo-bombing mission,

MIDWAY



"The approaching battle will be the biggest of the War, and may well be the turning point also."

Commander John C. Waldron, leader of the Hornet's Torpedo Squadron 8, which was later annihilated at the Battle of Midway.

pressing both these buttons at once will drop your bomb or torpedo.

Using the Controller to Pilot Your Aircraft

Your plane will respond to the direction you move your controller much the same way a real plane would. For more information, see the *Flight Fundamentals* section.

Controller Direction	Function
Controller forward (away from you)	Move the nose of the plane down
Controller backward (toward you)	Move the nose of the plane up
Controller right	Bank the plane to the right
Controller left	Bank the plane to the left

Controller Button Features

These allow you to fire your forward-firing guns, and to drop your warhead load.

Controller Button	Function
Left controller button (or space bar)	Fire main machine gun
Right controller button (or **RETURN**) (may be button on tip of joystick)	Fire 20 mm cannon (in Japanese *Zero* fighter only)
Left AND right controller buttons (or **RETURN**)	Drop warhead (torpedo or bomb, if you have one)

Additional In-Flight Keys

Key	Function
P	**P** Pause game; press any key to continue
Q	**Q** Quit game; get evaluation
E	**E** Toggle only the engine sound on/off
S	**S** Toggle ALL sounds on/off
V	**V** Display version of game
L	**L** Drop/lift landing gear (all planes except *Val*)
F	**F** Drop/lift flaps
B	**B** Open/close speed brakes (on *Dauntless* only)
+	+ Increase throttle (you do not need to use the shift key)
–	– Decrease throttle
G	**G** Flip gun sight up/down
C	**C** Toggle replay camera on/off
R	**R** Enter REPLAY mode (see page 68)
J	**J** Jump from plane, parachute to safety

Numeric and Keypad Controls

The following numeric and keypad keys control the different views you can switch to and from in your cockpit. Your computer may require the **NUM LOCK** on for keypad use.

Key	Function
8	**8** Look forward (your mission starts in this view)
6	**6** Look right
4	**4** Look left
2	**2** Look back (in torpedo or dive bomber, this also activates rear gun; see page 69)
3	**3** Look down (straight down, regardless of flight angle)
9	**9** Look around – (SCAN view, see page 69)

CATALINA

Replay Mode Controls

When you turn your camera on, it starts recording your actions. It stops when you turn it off or run out of film. Starting the camera again erases your old film, making a fresh recording.

When you are watching a replay of one of your aerial battles, use the controller to change your viewing angle. This lets you look at the replay from anywhere in the sky.

In the replay mode, your instrument panel will reflect what was happening to your plane during the original flight. When the replay is over, you will be back in your plane at the moment you started the replay. You may not use the replay mode after you have crashed or bailed out of your plane.

Additional Replay Mode Controls

Key	Function
Left button/space bar	Move forward (at a constant altitude)

+ Increase camera altitude

– Decrease camera altitude

R Reposition camera to your plane's location

F Resume normal flight

Rear Gun Controls

All dive bombers and torpedo bombers have rear guns. After you have switched from the front view to the rear view to control the rear gun, your plane will fly on "automatic pilot," with the controls set where you left them. If you stall or are about to crash into the water, return to the forward view to regain control of your aircraft.

Control	Function
Controller	Move rear gun and view; only works behind and above current position
Left button/space bar	Fire rear gun

8 Return to forward view and controlled flight

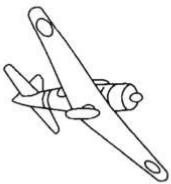
Scan View

Control	Function
Controller	Move viewing angle all around; angle degree is displayed
Any valid number key	Switch to a different view. The *8* key returns you to forward view.

"When you get to the end of your rope, tie a knot and hang on."

President Franklin D. Roosevelt

CORSAIR



Flight Review

Ending Your Mission

There are several ways to end your mission. You may press:

q

to end it at any time. The game may tell you to press this key once your mission has been completed (this is to give you time to look at a replay before you end your mission).

The mission will also end if you crash or are shot down. You may ditch your plane (come to a level landing on the water), or parachute safely down to the water. In rare instances, you may even run out of fuel. In any case, once your mission is over, you will be given a flight review.

NOTE: If your current pilot is killed in action during a mission, you will not be able to repeat that mission. You'll have to start up a new pilot, or fly with the assigned pilot, TRAINEE.

Your Flight Review

This takes place in the Ready Room. On the screen before you, you'll see your commander, and a written description of how well you performed in your mission.

The most critical factor in your review is whether or not you have successfully completed the mission. On fighter intercept missions where you are defending your carrier, quitting before the enemy planes have attacked is NOT a successful completion. You need to shoot down or drive away all attackers. If you are on a fighter escort mission, your priority is to keep the enemy aircraft away from the planes you are escorting. Finally, if you are on a bombing mission, you must make a successful hit on an enemy ship with your

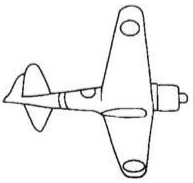
After attacking the Japanese carrier *Kaga*, First Lieutenant Daniel Iverson, Jr., reported that the ship fired back at him with "an entire ring of fire from the flight deck." His SBD was then attacked by several *Zero* fighters, and his throat microphone was severed in the skirmish. He was forced to crash-land on Midway, where stunned onlookers counted 210 holes in his plane.

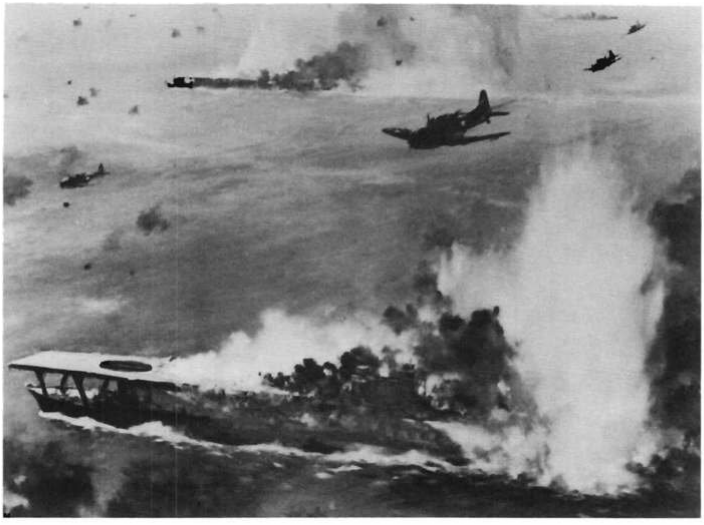
"This man was God to a new pilot." When landing on a carrier, the pilot's eyes were on the landing signals officer, who used these paddles to help the pilot correct his approach. Here, the officer indicates that the plane is banking too far off to the right-hand side of the carrier, and should be lined up more to the center. ***Courtesy of Franklin Avery***

warhead (torpedo or bomb) to complete your mission.

The flight review blackboard also shows the number of friendly and enemy planes and ships that have been damaged or destroyed during your mission. The plane and ship symbols you'll see are for ALL kinds of planes and ships, not just the aircraft carriers and fighter planes pictured on the blackboard. The numbers under the *Tot* column are the totals of enemy losses; the numbers under the *You* column are the specific enemy losses you caused. If other friendly planes cooperate with you in shooting down an enemy plane, you'll get credit for it if more than half of the hits are yours. If you bomb an enemy ship and it sinks later, you'll get credit for the sinking even if it's hit by other bombs after yours. If you're an American pilot, the losses credited to you will make you

SENDAI





In this painting, *Dauntless* dive bombers destroy the Japanese carrier fleet at the Battle of Midway. *Courtesy of the U.S. Navy*

more likely to get a medal or promotion than if you're a Japanese pilot. If you fly for the Japanese, you're more likely to be rewarded for distinguished service.

Once you've seen your flight review, press any key or your controller button to get to the next screen. If you've just finished an Active Duty mission and didn't change any mission parameters on the Ready Room screen, you'll see your current Service Record on the screen (see the *Review Service Records* section for more information). You may even be eligible for a medal or a promotion. To exit from these screens, press any key or your controller button. This will send you to a text screen. There, you'll have two choices. Pressing ***s*** will repeat the same mission, while pressing **RETURN** will send you to the Main Menu.

Medals and Promotions

To win a medal, move up in rank, and make the *Best Missions* list, the most critical factor is fulfilling your basic mission requirements. If you've successfully guarded your ship, escorted those torpedo bombers, or whatever your mission called for, you're more likely to be rewarded. Causing other damage to the enemy is secondary. In attack missions, every bomb or torpedo that hits an enemy ship helps your chances for promotion significantly. Of course, damaging friendly planes and ships will count against you. Finally, protecting other friendly planes will add to your final rank.

"I regret that I only have one life to give for my country. I'd feel safer if I had two or three."

Anonymous U.S. Navy flyer

HALSEY

United States Navy Medals

(Listed in order of rank)

After you have successfully completed an Active Duty mission in *Battlehawks*, you may be awarded one of the following medals:

Congressional Medal of Honor

The highest award in the U.S. military, the Medal of Honor, was the first medal established by the United States government, and was approved by Congress and signed into law by President Abraham Lincoln on December 21, 1861. It may given both in wartime and peacetime for an extraordinary act of heroism or self-sacrifice in a combat or non-combat situation. The Medal of Honor is awarded by Congress to a person who "distinguish(es) himself conspicuously by gallantry and intrepidity at the risk of his life above and beyond the call of duty and without detriment to the mission of his command or to the command to which attached." It is the only medal presented by the president in the name of Congress. The Medal of Honor may be awarded only once; a Gold Star is awarded instead of a second medal, and is worn on the ribbon of the Medal of Honor.

Navy Cross

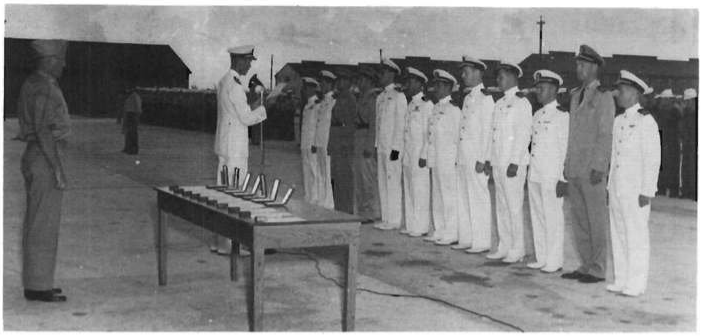
Awarded for outstanding heroism while engaging an armed enemy, the Navy Cross is the highest U.S. Navy medal given strictly for combat action and ranks just below the Medal of Honor. A Gold Star is awarded if a second Navy Cross is warranted.

Distinguished Service Medal

This award is presented for "exceptionally meritorious service to the government in a duty of great responsibility" in a combat or non-combat situation. Only one Distinguished Service Medal may be given to an individual, with a Gold Star given instead of additional medals.

Silver Star Medal

This medal is awarded for an act of "gallantry and intrepidity in action" that does not warrant the



U.S. Navy medal-awarding ceremony. ***Courtesy of Franklin Avery***

awarding of the Medal of Honor or the Navy Cross. It is the second-highest award given strictly for combat action, ranking just behind the Navy Cross.

Distinguished Flying Cross

A person may be awarded this medal if they perform an extraordinary act of heroism while in flight, either in a combat or non-combat situation. It can only be awarded once; a Gold Star is given for subsequent heroic acts.

Air Medal

The Air Medal is given to an individual who distinguishes his or herself with "meritorious achievement in an aerial flight," either in combat or non-combat actions. It ranks just below the Distinguished Flying Cross.

Purple Heart

Originally established by George Washington in 1782, this medal is given to any individual who is wounded by enemy action in such a way that requires medical treatment. A Gold Star is awarded if wounded in action again.

Japanese Navy Medals

Unlike their United States Navy counterparts, the Japanese did not honor their military heroes with medals or other citations for acts of bravery. To single out an individual for such an award would have been inconsistent with the Japanese emphasis on the group over the individual. Acts of bravery and self-sacrifice were expected of Japanese airmen, and even the concept of the "ace," so widely idolized by the Americans, was ignored by the Japanese. A posthumous promotion in rank was the only official recognition of bravery in combat.

Order of the Rising Sun

While the Japanese did not recognize heroism with a medal, on rare occasions they did honor meritorious service with the Order of the Rising Sun. This medal had eight different classes, each representing how distinguished the act of service was. Originally founded in 1875, the Order of the Rising Sun was awarded in both wartime and peacetime. Officers, noncommissioned officers, and even civilians were eligible for this medal.

"We had many great pilots. Some scored many victories, and others not at all. Many sacrificed their lives in *kamikaze* operations. Our victory score, whatever it may be, is of no importance now. We did not have "aces" because we did not create them. And it doesn't matter who was number one, two, or three — they were all equal in our eyes."

Former* Zero *Pilot,
quoted by Aviation Historian Henry Sakaida

Campaign Medals

These were issued to personnel who participated in various campaigns during the Pacific war. In *Battlehawks*, a Campaign Medal is awarded for successfully completing an Active Duty mission at the Battle of the Coral Sea, the Battle of Midway, the Battle of the Eastern Solomons, or the Battle of the Santa Cruz Islands.

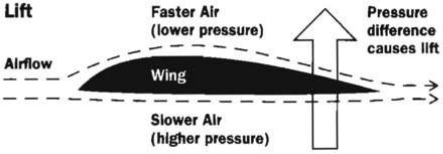
Promotions

In both the U.S. and Japanese Navies, promotions were granted based on experience more than individual valor. Simply by serving well, not losing too many planes, and surviving, pilots would rise in rank. In the U.S. Navy, the exception to this rule was when a pilot flew a particularly successful mission. This would often result in a promotion. Similarly, the Japanese sometimes honored their war dead with a posthumous promotion. A Japanese pilot's highest honor (or, more appropriately, his family's highest honor) was a posthumous double promotion.

Flight Fundamentals

This chapter discusses the dynamics of flight, both in a real working aircraft and in *Battlehawks 1942*. The paragraphs that apply these dynamics to the game situations are in italics.

Although today's military aircraft are strikingly different from their World War II predecessors, they both share many of the same aircraft design fundamentals. And they both rely on the same aerodynamic principles to get off the ground and maneuver in the air, starting with the principle known as **lift.**



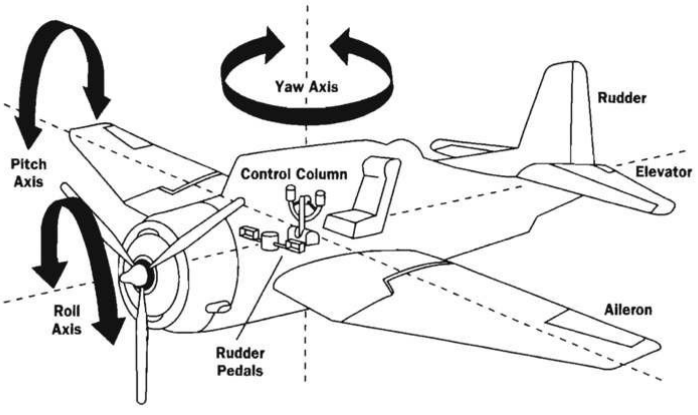
If you've ever stuck your hand outside a moving car window and felt the wind rush over it, you've already experimented with lift. When you hold your palm down, then rotate it upward, your arm is pulled up. This is caused by lift, or the vertical "push" of air flowing around your hand, which creates high air pressure below your hand and low air pressure above it.

Substitute an aircraft wing for your hand and you have some idea of how a plane flies. Of course, the wing of a plane has a much more streamlined, aerodynamic shape than your hand. This shape is needed

"This war is like no other war the world has ever seen. The development of air power has brought forces into play that have never been used before. It is true that we had aircraft in the First World War, but we had no such aircraft as the ingenuity of man has produced today. In that war, we had no aircraft carriers. Their advent has changed the entire character of naval warfare.

"Control of the seas, formerly dependent on battleships and ships of the line, is now dependent upon control of the air. Our enemies in the Pacific understood the significance of this change and started the war with a superiority in carriers. But no country in the world can employ these weapons as effectively as the American Navy."

Admiral Frederick C. Sherman, U.S.N., September 26, 1942



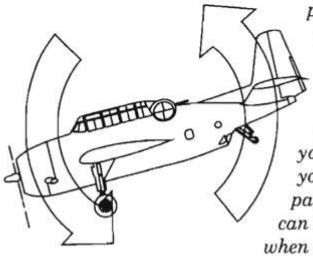
to create high and low pressure zones around the wing, as well as to ensure a smooth flow of air around it. Furthermore, without a streamlined shape, too much **drag**, or wind resistance, is produced, which will reduce the amount of lift.

A wing needs a continuous, smooth flow of air over and under it to produce lift. To create this, an engine drives a propeller to provide forward **thrust**. Lift increases with airspeed; the faster the forward thrust, the more lift is created.

▲ *To increase your thrust, increase your throttle setting. See the* Keyboard Reference *section to find out how to adjust your throttle.*

When this smooth flow of air around the wing is interrupted, a dangerous situation known as a **stall** can occur. This happens when the wing is tilted upward at a steep angle or when the plane is moving too slowly. When a plane stalls, it can go out of control and crash.

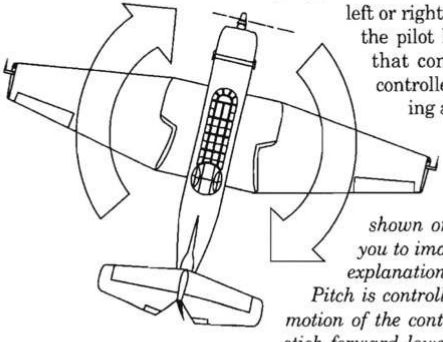
▲ *In* Battlehawks, *stalls may occur when the plane's airspeed drops below 70 MPH. If this hap-*



Pitch down:
push control column forward

pens, push forward on your control stick (see below) until the message STALL RECOVERED appears, showing that you're now going fast enough for normal flight. Then, quickly pull back on the stick until you're level. It's easy to stall when you're trying to fight a plane that is passing by at a higher altitude. This can be deadly. Stalls are also dangerous when flying low and slow, which unfortunately are the very conditions necessary for a successful torpedo attack. Learn to judge when you are close to stalling from the sound your engine makes, as well as by watching your airspeed indicator.

When in flight, the plane can maneuver three different ways. It can **pitch**, or move up or down; it can **yaw**, or swivel left or right; and it can **roll**, or bank left or right. To execute these maneuvers, the pilot has a **control stick** or **column** that controls pitch and roll. Yaw is controlled by a combination of pitching and rolling.



Yaw right:
pull control column right, then back

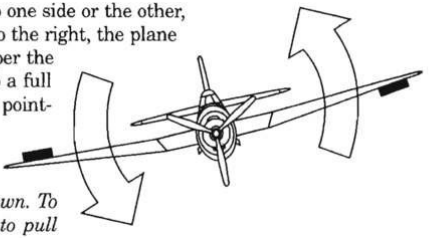
▲ *The stick is controlled in* Battlehawks *by either the cursor keys, a joystick, or a mouse. The stick is not shown on the screen, but it may help you to imagine the stick in the following explanations of maneuvers.*

Pitch is controlled by forward and backward motion of the control stick. Pushing the control stick forward lowers the nose; pulling the stick back raises it. If you push forward or pull back far enough, the plane may loop, flipping completely over.

The best way to execute a turn is to combine yaw with roll and bank the plane either left or right. Roll is controlled by moving the control stick left or right, which causes the plane to roll in that direction. When

the plane has its wings tilted to one side or the other, it is in a **bank**. When banking to the right, the plane will turn to the right. The steeper the bank, the faster the turn, up to a full 90 degree bank with the wings pointing straight up and down.

▲ *Steep banking will cause you to lose lift, and the nose of your plane will pitch down. To counteract this, you may wish to pull back on your stick slightly or increase your throttle when you bank. Then, to come out of the turn, push the stick in the opposite direction (for example, when turning right, push left), which should level your plane.*



Roll right: push control column right

Flaps are the trailing-edge (or rear) sections of the wing that are hinged downward to increase lift. When they're fully extended downward, flaps can also slow the airplane by increasing the amount of drag on a wing.

▲ *Since torpedo-bombing missions require low, slow flight, flaps can come in handy.*

Speed brakes are special flaps found only on dive bombers. They open both up and down from the back of the wing and are perforated to avoid buffeting when they are open.

▲ *Use speed brakes to slow your dive as you come in to drop a bomb on a ship.*

Landing gear are the wheels of your plane along with their supports.

▲ *All the planes in* Battlehawks *can extend or retract landing gear except for the Japanese* Val *dive bombers, whose gear are permanently fixed in an extended position. By extending your landing gear, you can slow your plane down quickly by increasing drag.*

To find out more about advanced flying techniques, see the *Aerial Tactics and Tips* section.

Aerial Tactics and Tips

This section describes many of the tactics used in combat by World War II pilots, as well as those that are applicable to game situations in *Battlehawks 1942*.

A valuable tool for analyzing your tactics for any engagement is the replay feature of *Battlehawks*. This lets you record your action and then view it from any angle. See the *Keyboard Reference* section for more information.

Fighter Tactics: 1942

Whether escorting dive bombers and torpedo planes, or providing aerial defense cover for an aircraft carrier, the fighter pilot had but one principal task: shoot down enemy aircraft as quickly as possible. When the enemy was sighted, a pilot had to quickly maneuver his fighter into a position to attack the often swift and maneuverable enemy planes. There were several approaches a fighter pilot could take to make an attack, depending on his position relative to the enemy and the speed and direction the enemy planes were flying in.

The **stern attack** was an approach that dated back to the earliest aerial duels, and was the easiest for poor marksmen. An attacking fighter would simply get on the tail of the enemy and fire a short burst. This attack could start from a higher or lower position, or from the same altitude as the enemy. The stern approach could be dangerous if the enemy aircraft had a tail or rear gunner who could fire back, or if the enemy was more maneuverable.

On his way back from bombing Japanese carriers at Midway, Lieutenant Commander Wade McCluskey's SBD was attacked by *Zero* fighters. His plane was shot up by fifty-five bullets from the *Zeros* — and from his own tail gunner. Since the twin barrels of the tail gun were eight inches apart, the gunner believed he could shoot on both sides of the rudder at the same time. Luckily, what was left of the rudder was enough to get them back to the *Enterprise*.

The **opposite attack** sometimes gave equally great shots to both the enemy aircraft and the attack-

ing aircraft! In this approach, the attacking fighter would fly head-on at the enemy plane and fire continuously. U.S. Navy pilots using this approach would try to come up from slightly underneath the enemy at a 15 degree angle, where the enemy aircraft was especially vulnerable. This way, if the enemy tried to dip its nose down and fire, it risked a head-on collision. After this attack was executed, it was often difficult for either plane to set up another approach unless they both turned toward each other again.

Wreck of a Japanese *Zero* fighter. *Courtesy of the Smithsonian Air and Space Museum Library*

In these two types of attacks, pilots could fire straight at the target. However, since attacking planes often had to pursue the enemy at angles, the pilots sometimes needed to fire ahead of the target. That way, the bullets would arrive in a given area at the same time as the enemy aircraft. This was known as **deflection shooting**.

This shooting skill was necessary for more complicated approaches, such as the **overhead approach from the same course.** This called for the attacking aircraft to fly in the same direction as the enemy and at a position 2,000 feet above. When the attacking pilot reached a position ahead of the enemy and in the

"You must shoot at a spot out in space which will be full of airplane when your bullets get there."

Lieutenant Commander James H. Flatley, on the fundamentals of deflection shooting

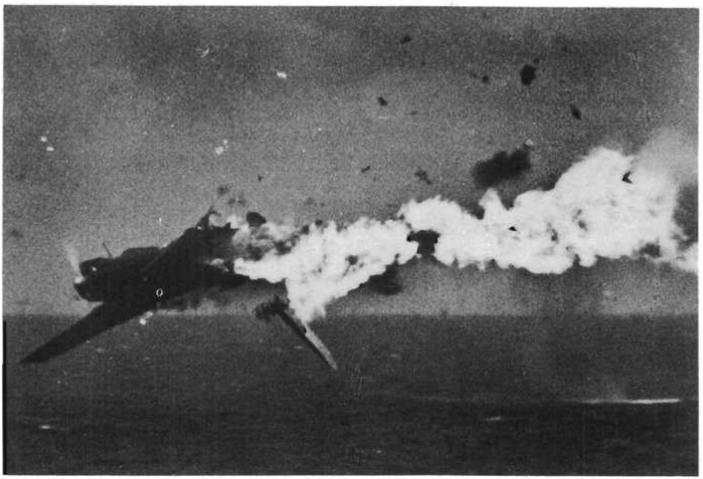
same vertical plane, he would roll up and over onto his back. Continuing the roll, he would dive down on the enemy at a 60 degree angle, and attack at a 45 degree angle. This gave the attacking aircraft many opportunities for a clear shot, and made it difficult for the enemy to fire back.

The **overhead approach from the opposite course,** which was slightly easier to execute than the same course approach, was used when the attacking aircraft and the enemy aircraft were flying toward each other. Again, the attacking fighter had to be at least 2,000 feet higher than the enemy. As the enemy got closer, the attacking fighter would bank his wings at a 90 degree angle to keep the enemy in his sight. When the attacking aircraft reached the same vertical plane as the enemy and the two planes had passed each other, the attacker would execute a half-roll and drop the nose of his aircraft toward the enemy. Like the same course approach, the attacker would dive at a 60 degree angle, and attack at a 45 degree angle.

Both of these overhead attacks were difficult to execute. They required a good deal of air space both above and below the enemy aircraft, so they could not be used at low altitudes. Yet, when executed properly, they could be extremely effective.

Once the weaknesses of the *Zero* fighter became known to U.S. Navy pilots, they began trying a new evasive tactic. When a *Zero* got on the tail of a U.S. Navy fighter, the American pilot would dive straight down toward the ocean, and pull out just before impact. If the *Zero* tried to pull out when the U.S. fighter did, it would sometimes disintegrate, as it was not as strong structurally. If the *Zero* did not pull out in time, it would crash into the sea.

Finally, the **side attack** was a true test of marksmanship because of the amount of deflection shooting required. It could be executed above the enemy's flight path, at the same level, or below the flight path. Flying parallel to the enemy, the attacking fighter would execute an *s*-turn, briefly heading in the opposite direction of the enemy before turning in and beginning his attack at a 90



Hit by anti-aircraft fire from a U.S. Navy carrier, a *Kate* goes down in flames. ***Courtesy of the U.S. Navy***

degree angle. As the attacking pilot finished his *s*-turn, the final loop would put him closer to actually following behind the enemy.

Like the overhead attacks, side attacks offered the enemy a poor target to shoot back at. They were also ideal at low altitudes, when overhead attacks could not be executed.

Fighter Tactics: *Battlehawks 1942*

▲ ***Deflection shooting*** *was a specialty of American fighter pilots, who practiced it frequently with difficult side approaches. In* Battlehawks, *use the gunsight to help you determine where to aim. You will need to compensate for the speed of your target, the angle at which it crosses your line of sight, and its distance away from you. When it is faster, closer to perpendicular to your path, or farther away, you will have to lead your shots more. Try to judge the direction it is flying,*

"If there is only one plane left to make a final run in, I want that man to go in and get a hit."

Message from Commander John C. Waldron, leader of the *Hornet*'s Torpedo Squadron 8, to the men in his squadron the night before they were to attack the Japanese carrier fleet

and aim along an imaginary line in front of it. You can judge distance by seeing how large the plane is compared to the rings of your gunsight. With practice, you'll be able to score hits every time.

The Japanese excelled at tactics that used their planes' superior agility. The ***scissors*** *was a maneuver used often by the nimble* Zeros *against the more sluggish American planes. If an enemy is behind you, simply alternate steep banks, turning first left, then right, then left again, while cutting back on your throttle to slow down. The plane behind you will not be able to turn as quickly and will gradually pull ahead of you. This should put you on its tail.*

If an enemy plane heads toward you then passes you, your fastest way to turn is not to bank to one side but to execute a fancy maneuver. Two good ones are the ***Immelman turn*** *and the* ***split-s****. The Immelman is useful when your target is at the same or a higher altitude and you aren't close to stalling speed. To execute it, pull back on your stick and flip completely over, so you are upside-down pointing directly back along your path. If you perform this maneuver correctly, you should see the enemy plane in front of you. Push the stick to one side or the other to right your plane.*

The split-s is sort of a vertical mirror image of the Immelman. Use it to turn around if you are close to stalling speed, if you need to shake an opponent, or if the enemy has passed by below you. First, push the stick fully to one side (preferably toward the enemy who has just passed beneath you) until you are upside-down. Then, pull back on the stick until you have looped back to a vertical position. Don't try this if you are within a thousand feet of the water! If you execute this maneuver correctly, you'll be flying back the way you came but at a lower altitude. By banking a little as you are pointing straight down, you can quickly change your final direction to any angle you want.

Dive-Bombing Tactics: 1942

In the war in the Pacific, dive-bombing was a deadly art that required as much raw nerve as it did sheer flying ability. For attacking moving targets, such as ships, it was much more accurate than high-level bombing, but it was also much riskier.

Flying at an altitude as high as 12,000 feet to avoid enemy detection, a dive bomber pilot would pick out a target. Then, he would open his dive flaps so that his diving speed would be about 250 MPH, and push the stick forward so that his aircraft would

SBD *Dauntless* pilot Lieutenant (j.g.) Tommy "Tex" Wiggins and his rear gunner. *Courtesy of Franklin Avery*

"I do like to see the arms and legs fly."

General George S. Patton III

plunge toward the target at a 70 to 75 degree angle. The direction of the dive determined the trajectory of the bomb so the pilot kept the nose of the dive bomber right on the target, preferably the stern of the ship.

For a harrowing 35 to 40 seconds, the aircraft would dive while anti-aircraft fire burst around it. The pilot would keep his eye on his bomb-sight telescope and move the ailerons to adjust for wind or any movement of the target. Frequently, pilots would zigzag during the first part of the dive to make the plane a more difficult target for enemy fighters and anti-aircraft fire.

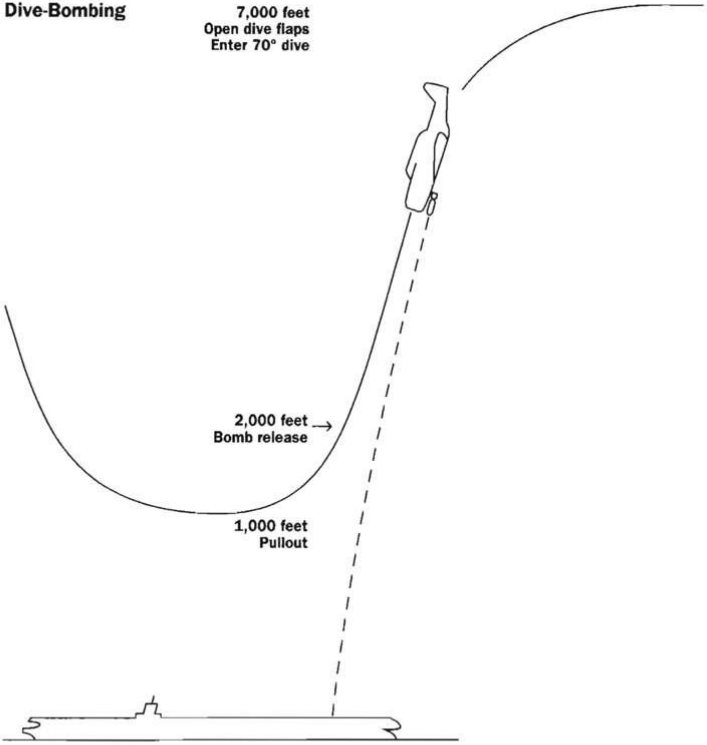
At around 2,000 to 1,500 feet, the pilot would release the bomb. Since a bomb takes less than three seconds to hit a target from 1,000 feet, the aircraft would be in danger of being blown up by its own bomb if it dived any lower. The pilot would then quickly pull the nose up, subjecting himself to a large amount of centrifugal force — usually from 5 to 6 Gs. If he was lucky and anti-aircraft fire or a fighter cover didn't get him, he would then hear the unmistakable sound of his bomb exploding on the target.

Dive-Bombing Tactics: *Battlehawks 1942*

▲ *You should start your dive from at least 5,000 feet up, preferably from 7,000 feet. Below 5,000 feet, you may not be able to dive, aim, drop, and pull out in time. Starting your dive at an even higher altitude is fine. Use your speed brakes to limit the velocity of your dive; the extra time will give you plenty of opportunities to correct your aim.*

To aid you in your approach to the target, Battlehawks *provides you with two special views. The* ***scan view*** *allows you to fly in one direction while you look in another. Use this to look down while continuing to fly level, and thus adjust your course so you are headed directly toward the target ship. Then switch to the* ***straight down*** *view. See the* Keyboard Reference *sec-*

Dive-Bombing



tion to find out which keys control these views on your machine.

If you have lined up correctly with your target ship, it will eventually creep into view below you. This is the time to go into your dive. You may wish to switch on the camera to record your bombing run. Then, extend

"The water in all directions seemed full of torpedo wakes."

Captain Frederick Sherman of the *Lexington*, describing the attack on his carrier during the Battle of the Coral Sea

the speed brakes, select the forward view, and push the control stick forward into a steep dive. By watching your pitch indicator, you can judge how steep your descent is. A 70 degree dive (about 3/4 of the way down the indicator) is ideal for your final approach.

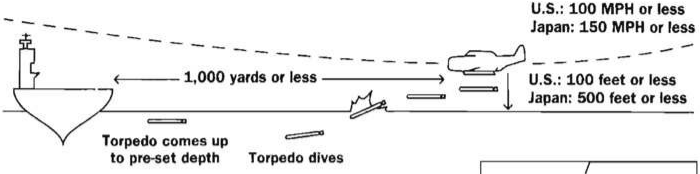
A longitudinal attack approach, along the line of your target ship's course, is best as you'll have a longer area for your bomb to hit. Attacking your target ship from the bow is better than from the stern since the ship will sail directly away from you in a stern attack. This will force you to flatten your dive to catch it, and will also pull you out of the relatively safe region directly over the ship. Remember that it is more important to surprise the enemy with your attack than to take the time to line up for the perfect attack approach. Always go directly for the ship. With practice, you'll be able to hit a ship even with an angle of attack that's perpendicular to its course.

In your dive, you may see that your target is not directly in front of you but rather to one side or the other. Correcting your aim just by banking is dangerous since this could force you to slip or skid (moving sideways in relation to the direction your plane is pointing). To avoid this, push forward until you are in a nearly-vertical dive — all the way down on the pitch indicator. Then you can rotate your plane by moving your control stick left or right until the target is directly in front of you. Pull back gently to resume your 70 degree dive.

As you get closer to the enemy carrier, ignore the flak bursts. Your mission is critical, and you don't need the added problems of dodging flak while aiming. If there are other friendly planes joining you in the attack, it is very important to stick together and use defensive fire to protect each other. But once you have released your bomb, by all means split up from the group, and weave and dodge to make yourself a tougher target.

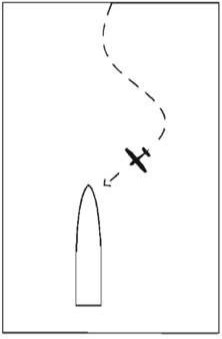
Fighter defense is another critical problem. Dive

Torpedo Plane Attack



bomber pilot Richard Best would often shake a fighter plane by letting it approach from behind, then going into a sharp turn just as it came within range. This threw off the aim of the fighter, causing it to miss. Meanwhile, the rear gunner of his dive bomber had a minimum deflection shot at the approaching enemy.

As you near 2,000 feet you should be ready to release your bomb. If you are in a 70 degree dive, your gunsight should be pointed slightly ahead of where you want the bomb to fall to compensate for gravity pulling the bomb out of the line of your dive. If you release too high, the bomb will fall longer and stray farther from your aiming point.



Best approach angle for torpedo attack

Torpedo-Bombing Tactics: 1942

Launching a torpedo from a moving plane against a moving ship was an extremely difficult art that the Japanese excelled at. This was due to their complete mastery of torpedoing techniques, an excellent torpedo, and, for a while, a better torpedo plane (the American TBD *Devastator* was far less effective than the Japanese *Kate,* though the TBF-1 *Avenger* proved to be a successful replacement).

To launch a torpedo strike against a ship, a torpedo squadron would cruise at a high altitude and dive when a target was spotted. They would break out of their dive at an altitude of 100 feet or less above the ocean. Sometimes a torpedo squadron would split up

An impromptu tactics discussion on the flight deck of a carrier. ***Courtesy of Franklin Avery***

to attack a target from different directions. If they flew together in formation, torpedo planes were easier targets for fighters and anti-aircraft fire, as were the American torpedo squadrons at the Battle of Midway.

Flying at a low altitude, a torpedo plane would approach a target. The preferred attack position was to be facing either the bow or stern of the ship, since any way the ship turned would leave it vulnerable to a hit. When the torpedo plane was within 1,000 yards or less of the target, the torpedo was released.

A lot could go wrong with a torpedo once it was launched. It had to land perfectly flat on the water to run true to the target. If it landed at a sharp angle, it

would dive straight down; if it landed at a shallow angle, it would bounce up and down on the surface. Occasionally the torpedo would simply break up when it hit the water. If the torpedo did land perfectly, it was designed to dive, then rise to a pre-set depth just below the surface. If the depth mechanism was faulty, it could cause the torpedo to run too deep and end up going underneath the target. Sometimes, a slow-moving torpedo could be exploded by machine gun fire aimed at its warhead.

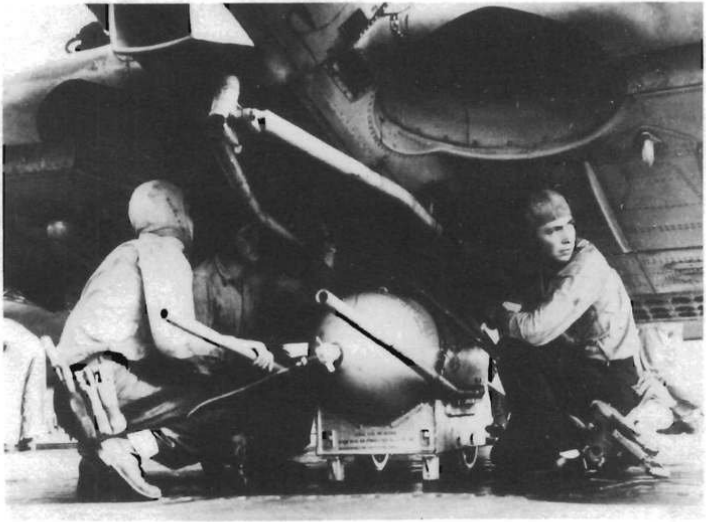
And even if all went well and the torpedo did hit the target, there was always the chance that it would be a dud and fail to explode. American torpedoes were notorious for this, to the point where it was an occasion to celebrate when one actually did detonate. But when a torpedo hit and exploded, it struck a highly-damaging blow to a ship in a vulnerable area — below the waterline. The ability to inflict such damage on a surface ship, no matter how great the odds of failure, made torpedo-bombing an important weapon in the Pacific war.

A TBF *Avenger* high above Wake Island. *Courtesy of Franklin Avery*

Torpedo-Bombing Tactics: *Battlehawks 1942*

▲ *The best attack approach to make when your target is sighted is to stay low, coming in just a few feet above the water. By flying at a low altitude, you risk disaster in a stall but you also make it hard for enemy fighters to safely engage you. As they dive in at you, they will need to attack at a very shallow angle or risk crashing into the water themselves, since they are limited to firing in the direction they fly. Furthermore, your rear gunner has no such limitation and can pick them off while you fly a steady course toward your target.*

To make the most of your rear gunner, make sure you are flying level, or at least in a gradual climb with no loss in speed, before switching to the rear view. Since you're one person doing the job of two, you'll



A *Dauntless* being loaded with a bomb during the campaign for Guadalcanal. *Courtesy of the U.S. Navy*

have to make sure the plane is on a relatively safe heading before looking back.

As with dive-bombing, try to ignore the flak on your way in. Staying low is your best defense. A higher approach may give you more room to maneuver, but it will expose you to more gunfire. It will also force you to waste precious seconds diving into position and slowing to torpedo-release speed before dropping your "fish."

To release your torpedo, you'll have to fly low, slow, and level. If you're flying an American TBF Avenger, *with inferior torpedoes, you'll have to stick below 100 feet and 100 MPH. If you fly any faster or higher, your torpedo will malfunction when it hits the water. If you're piloting a Japanese* Kate, *with its powerful "Long Lance" torpedoes, you can fly up to 150 MPH at an altitude of up to 500 feet, but you should stay low anyway to avoid anti-aircraft fire.*

Because guns are arranged all along the length of a ship, your safest approach is directly toward the bow or stern. To maximize the chance of a torpedo hit, the head-on approach (toward the bow) is strongly recommended. Then, swing to one side or the other to release your torpedo at a small angle off the bow. Remember to turn and dodge once you've released the torpedo.

After the Japanese attack on Pearl Harbor, Rear Admiral Chester F. Nimitz was appointed Commander In Chief of the U.S. Pacific Fleet. He glumly broke this news to his wife, who reminded him that "You've wanted this command all your life."

"But sweetheart," said the admiral, "all the ships are on the bottom."

Photo courtesy of the U.S. Navy

Japanese and American Aircraft: 1942

There were three different types of aircraft on board both Japanese and American aircraft carriers. The first, called **fighters**, were the smallest and most maneuverable. Their two main missions were to protect ships from incoming enemy bombers (**fighter intercept mission**) and to protect their own bombers on their way to enemy targets (**fighter escort mission**). The primary Japanese carrier fighter in 1942 was the *Zero,* while the main American carrier fighter was the F4F *Wildcat.*

The second group of carrier planes were called **dive bombers**. Larger and less agile than fighters, dive bombers were designed to drop bombs on sea or land targets. This **dive-bombing mission** was accomplished by diving down on the target at a steep angle, then releasing the bomb at an altitude low enough for maximum accuracy, yet high enough to escape the resulting bomb blast. Sometimes dive bombers were used for scouting and reconnaissance missions, though they carried bombs in case they found a target. In 1942, the Japanese used the *Val* bomber for dive-bombing missions, while the Americans relied on the SBD *Dauntless* dive bomber.

Finally, **torpedo bombers** made up the third group. In a **torpedo-bombing mission**, these bombers would attack enemy ships by flying toward them at a very low altitude, then releasing self-propelled torpedoes, which would speed to the targets. A low flying altitude was necessary because the gyroscopes on torpedoes would malfunction if dropped from too high up. The *Kate* torpedo bomber was used by the Japanese, while the U.S. Navy *Avenger* torpedo bomber saw its first Pacific action in mid-1942.

Aircraft Squadron Designations

Carrier aircraft personnel were divided into four different types of groups, or **squadrons.** In the U.S. Navy, fighter squadrons were designated by the let-

Members of an SBD *Dauntless* dive-bombing squadron.
Courtesy of Franklin Avery

ters *VF,* with *V* being the symbol for "heavier-than-air craft," and *F* for fighter. *VB* stood for dive-bombing squadron, *VT* for torpedo squadron, and *VS* for scout or reconnaissance squadron, which was essentially another dive-bombing squadron. These identification letters were followed by the identification number of the carrier the squadron was based on. The number *2* was for the *Lexington*, *3* for the *Saratoga*, *5* for the *Yorktown*, *6* for the *Enterprise*, and *8* for the *Hornet*. Therefore, if your squadron was called *VB-6,* you were in a dive-bombing squadron based on the *Enterprise*. If you were a member of *VT-3,* you were part of the *Saratoga's* torpedo squadron, and so on.

The Japanese Navy had similar groupings for their carrier aircraft personnel. All the aircraft on board a given carrier comprised the **carrier air unit**, or *hikokitai*, and was divided into three **flying units.** These units were the equivalent of U.S. Navy squadrons. Fighters made up the **carrier fighter unit**, and dive bombers were the **carrier bomber unit**. The third unit was called the **carrier attack unit**, and was made up of aircraft that could be used as either torpedo bombers or dive bombers.

Japanese Naval Aircraft

Mitsubishi A6M2 Type 0 Model 21 *Zeke* Carrier-Based Fighter

The plane that terrorized Pacific skies, the A6M2 *Zeke,* or *Zero,* was a key participant in nearly every Japanese naval action of the Second World War. This swift, long-range fighter could outfly and outmaneuver every type of U.S. fighter during the first two years of the war. The earliest version of the A6M2 was extremely successful in the China campaign, at one point destroying ninety-nine Chinese aircraft, with only two *Zeros* lost to ground fire. In later attacks on Pearl Harbor, Wake Island, Darwin, Ceylon, the Philippines, and the Netherlands East Indies, the *Zero* was virtually unstoppable.

The A6M2 Model 21 was developed specifically for carrier operations. A 1 foot 8 inch section of each wingtip folded upward, allowing the Model 21s to fit inside carrier deck elevators. In combat, they were used for bomber protection, carrier defense, and for strafing military ground installations.

Mitsubishi A6M3 Type 0 Model 32 *Zeke* Carrier-Based Fighter

Just before the last major carrier battle of 1942, the Battle of the Santa Cruz Islands, the A6M2

A6M2 Evaluation:
Speed: excellent
Climbing: excellent
Maneuverability: excellent
Gun firepower: good
Durability: poor
Range: excellent

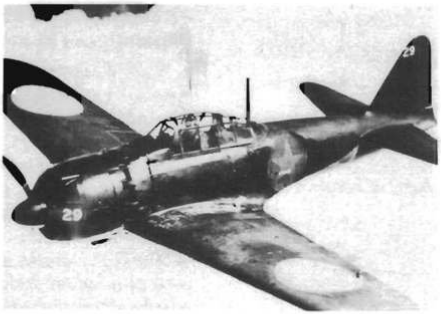
Performance:
Engine: one Nakajima NKIC Sakae 12 fourteen-cylinder, air-cooled radial
Horsepower: 940 at take off; 980 at 9,350 feet
Top speed: 331 miles per hour
Top climbing speed: 2,625 feet per minute
Ceiling: 32,810 feet
Range: 1,162 miles
Crew: one

Dimensions:
Wingspan: 39 feet 4 inches
Wing area: 242 square feet
Length: 29 feet 9 inches
Height: 10 feet

Weights:
Empty: 3,704 pounds
Loaded: 5,313 pounds
Wing loading: 22 pounds/square foot
Power loading: 5.5 pounds/horsepower

Armament:
Guns: two 7.7 mm Type 97 machine guns, mounted in the engine cowling, plus two 20 mm Type 99 cannon, mounted in the wings
Warhead: two 132-pound, wing-mounted bombs (ground attack)

Model 21 was replaced by the A6M3 Model 32. This updated version was faster than its predecessor due to its larger, more powerful engine. However, to make room for this engine, a smaller fuel tank had to be used, which reduced the range of the Model 32. Instead of folding wingtips, the Model 32 had a smaller wingspan, so it could still be used in carrier operations.



A captured *Zero* being flown for evaluation. ***Courtesy of the Smithsonian Air and Space Museum Library***

Both the A6M2 Model 21 and the A6M3 Model 32 were faster and more agile than their U.S. counterparts. But this speed and maneuverability came at the price of pilot protection. To save weight, the *Zeros* were less heavily armored than U.S. fighters, and also lacked self-sealing fuel tanks. As a result, hits that might not do much damage to a U.S. fighter would turn a *Zero* into a ball of fire. When these facts became known to U.S. pilots, they began to take advantage of this ability to outgun, if not outrun, the less-durable *Zero*.

A6M3 Evaluation:
Speed: excellent
Climbing: excellent
Maneuverability: excellent
Gun firepower: good
Durability: poor
Range: good

Performance:
Engine: one Nakajima NKIC Sakae 21 fourteen-cylinder, air-cooled radial
Horsepower: 1,130 at take off; 1,100 at 9,350 feet
Top speed: 338 miles per hour
Top climbing speed: 2,689 feet per minute
Ceiling: 36,250 feet
Range: 1,477 miles
Crew: one

Dimensions:
Wingspan: 36 feet 1 inch
Wing area: 232 square feet
Length: 29 feet 9 inches
Height: 11 feet 6 inches

Weights:
Empty: 3,984 pounds
Loaded: 5,609 pounds
Wing loading: 24.2 pounds/square foot
Power loading: 5 pounds/horsepower

Armament:
Guns: two 7.7 mm Type 97 machine guns, mounted in the engine cowling, plus two 20 mm Type 99 cannon, mounted in the wings
Warheads: two 132-pound bombs, mounted on the wings (ground attack)

"It was like taking the stairs while they took the elevator."

Lieutenant Commander Richard H. Best, describing dogfights with *Zeros*

Aichi D3A1 Type 99 Model 11 *Val* Carrier-Based Bomber

First delivered in 1940, this distinctive-looking dive bomber helped the Japanese achieve many of their victories during the early months of the war. The *Val* sank more Allied ships than any other type of plane, and figured prominently in Japanese successes in China, Indochina, the Indian Ocean, and at Pearl Harbor, where 126 D3A1s dropped the first Japanese bombs on U.S. ships.

The D3A1 was so maneuverable it was sometimes used as a fighter, though with its fixed landing gear, it had a relatively slow airspeed. Despite the fact that it could only carry a light payload, it was considered one of the best dive bombers of its time.

Aichi D3A2 Type 99 Model 12 *Val* Carrier-Based Bomber

With the staggering losses in aircraft carriers, planes, and crews suffered by the Japanese in the naval battles of 1942, many D3A1 *Vals* were assigned to land-based bombing duty in the Solomon Islands. Since their low fuel capacity and range made them

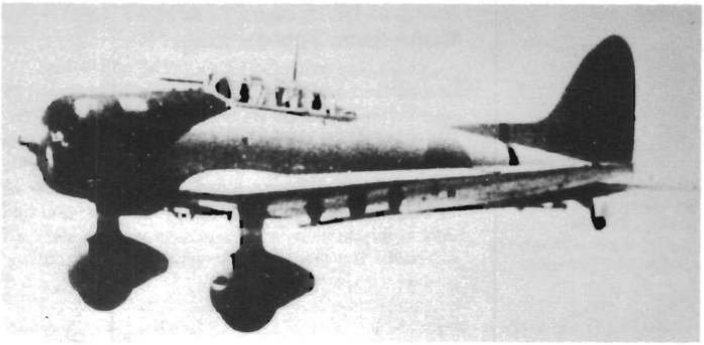
D3A1 Evaluation:
Speed: fair
Climbing: fair
Maneuverability: excellent
Gun firepower: fair
Durability: fair
Range: fair

Performance:
Engine: one Mitsubishi Kinsei 42 fourteen-cylinder radial
Horsepower: 1,000 at take off; 990 at 6,560 feet (earlier model)
Top speed: 240 miles per hour
Top climbing speed: 1,515 feet per minute
Ceiling: 30,500 feet
Range: 915 miles
Crew: two

Dimensions:
Wingspan: 47 feet 2 inches
Wing area: 376 square feet
Length: 33 feet 5 inches
Height: 12 feet 7 inches

Weights:
Empty: 5,309 pounds
Loaded: 8,047 pounds
Wing loading: 21.4 pounds/square foot
Power loading: 8 pounds/horsepower

Armament:
Guns: two forward-firing 7.7 mm Type 97 engine cowling-mounted machine guns and two rear-firing, flexible-mounted 7.7 mm Type 92 machine guns
Warhead: one 551-pound fuselage-mounted bomb; also could carry two 132-pound wing-mounted bombs (ground attack)



The *Val* — the best dive bomber in the world at the start of the Pacific war. *Courtesy of the Smithsonian Air and Space Museum Library*

insufficient for this task, they were replaced by the D3A2 Model 12. This improved version had a larger fuel tank, a more powerful engine, and a longer rear canopy section than its predecessor.

The D3A2 saw its first combat action in the fall of 1942. It was later used in the defense of the Philippines in 1944, and even saw service as a *kamikaze* plane during the last year of the war.

D3A2 Evaluation:
Speed: fair
Climbing: good
Maneuverability: excellent
Gun firepower: fair
Durability: fair
Range: good

Performance:
Engine: one Mitsubishi Kinsei 54 fourteen-cylinder radial
Horsepower: 1,300 at take off; 1,200 at 9,845 feet; and 1,100 at 20,340 feet
Top speed: 267 miles per hour
Top climbing speed: 1,697 feet per minute
Cruising speed: 184 miles per hour
Ceiling: 34,500 feet
Range: 915 miles
Crew: two

Dimensions:
Wingspan: 47 feet 2 inches
Wing area: 376 square feet
Length: 33 feet 5 inches
Height: 12 feet 7 inches

Weights:
Empty: 5,666 pounds
Loaded: 8,378 pounds
Wing loading: 22.3 pounds/square foot
Power loading: 6.4 pounds/horsepower

Armament:
Guns: two forward-firing 7.7 mm Type 97 engine cowling-mounted machine guns and two rear-firing, flexible-mounted 7.7 mm Type 92 machine guns
Warhead: one 551-pound fuselage-mounted bomb; also could carry two 132-pound wing-mounted bombs (ground attack)

Nakajima B5N1 Type 97 Model 11 *Kate* Carrier-Based Torpedo Bomber

An earlier version of the *Kates,* which were so effective in Pacific carrier battles, the B5N1 Model 11 enabled the Japanese to become the masters of the art of torpedo-bombing. The Model 11 went into production in 1937, and was first used in combat as a land-based bomber to support ground troops in China. Even though it was lightly armored, and had only a single rear-firing machine gun to ward off attackers, the Model 11 was highly successful in the

The versatile *Kate* enjoyed success whether dropping torpedoes or bombs. ***Courtesy of the Smithsonian Air and Space Museum Library***

B5N1 Evaluation:
Speed: good
Climbing: good
Maneuverability: good
Gun firepower: poor
Durability: fair
Range: good

Performance:
Engine: one Nakajima Hikari 3, nine-cylinder, air-cooled radial
Horsepower: 700 at take off; 800 at 11,485 feet
Top speed: 229 miles per hour
Top climbing speed: 1,257 feet per minute
Ceiling: 24,280 feet
Range: 1,404 miles
Crew: two

Dimensions:
Wingspan: 50 feet 11 inches
Wing area: 406 square feet
Length: 33 feet 9 inches
Height: 12 feet 2 inches

Weights:
Empty: 4,643 pounds
Loaded: 8,157 pounds
Wing loading: 20.1 pounds/square foot
Power loading: 11.5 pounds/horsepower

Armament:
Guns: one flexible 7.7 mm Type 92 rear-firing machine gun
Warhead: one 1,764-pound torpedo; also could carry 1,764 pounds of bombs

China campaign. Carrier-based versions of the Model 11 had folding wingtips that overlapped above the cockpit for easy storage aboard ship.

Nakajima B5N2 Type 97 Model 12 *Kate* Carrier-Based Torpedo Bomber

At the time of the outbreak of war between Japan and the United States, the B5N2 Model 12 was the most advanced carrier-based torpedo bomber in the world. It had replaced the earlier B5N1 Model 11 by the time of the Pearl Harbor attack, where 144 *Kates* did heavy damage to the U.S. battleship fleet. During the four critical carrier battles of 1942, B5N2s fatally wounded the U.S. carriers *Lexington*, *Yorktown*, and *Hornet*. They also saw service in campaigns in the Solomons and the Philippines, but advances in the aviation design of other aircraft relegated the *Kates* to aerial reconnaissance and anti-submarine duty at the close of the war.

In appearance, the B5N2 Model 12 was nearly identical to the B5N1 Model 11. The B5N2, however, had a larger, more reliable engine than the B5N1, a factor which was critical during long flights over the water. A redesigned cowling also provided a better view for the pilot, while reducing drag on the aircraft.

"Any direction I was able to look, I could see five, six, seven, or more aircraft on fire, spinning down, or simply out of control and flying around crazily."

Chief Aviation Pilot Wilhelm Esders, of the *Yorktown*'s Torpedo 3 squadron. Of the twelve Torpedo 3 planes which attacked the Japanese task force during the Battle of Midway, ten were shot down.

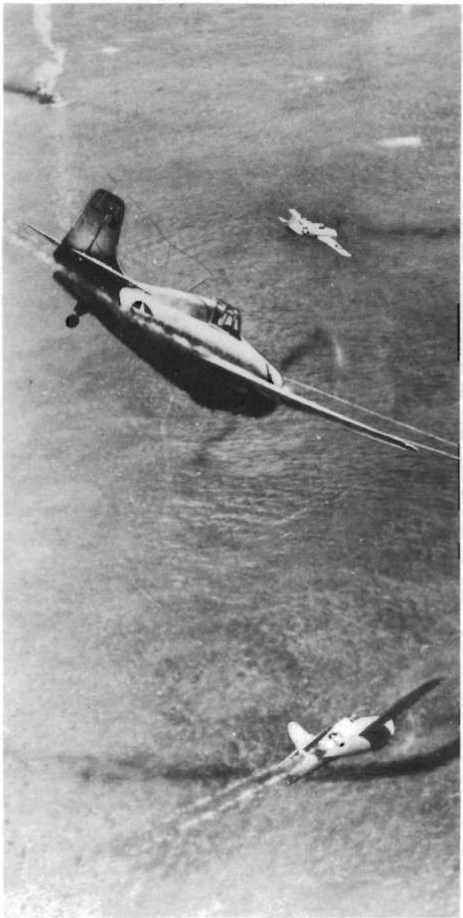
B5N2 Evaluation:
Speed: good
Climbing: good
Maneuverability: good
Gun firepower: poor
Durability: fair
Range: good

Performance:
Engine: one Nakajima NK1B Sakae 11 fourteen-cylinder, air-cooled radial
Horsepower: 1,000 at take off; 970 at 9,845 feet
Top speed: 235 miles per hour
Top climbing speed: 1,285 feet per minute
Ceiling: 27,100 feet
Range: 1,237 miles
Crew: two

Dimensions:
Wingspan: 50 feet 11 inches
Wing area: 406 square feet
Length: 33 feet 9 inches
Height: 12 feet 2 inches

Weights:
Empty: 5,024 pounds
Loaded: 8,378 pounds
Wing loading: 20.6 pounds/square foot
Power loading: 8.4 pounds/horsepower

Armament:
Guns: one flexible 7.7 mm Type 92 rear-firing machine gun
Warhead: one 1,764-pound torpedo; also could carry 1,764 pounds of bombs



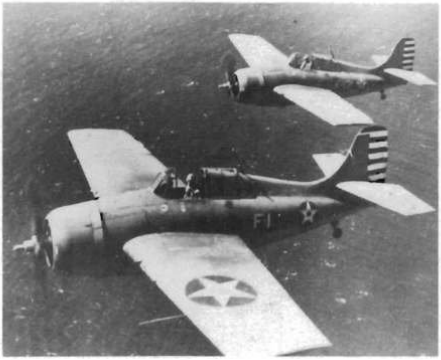
Grumman F4F-3 *Wildcat* Carrier-Based Fighter

The fighter that would be the mainstay of the U.S. carrier force until 1943 had its earliest incarnation as the F4F-3. After the first version had fared miserably in performance tests, the addition of a more powerful and reliable engine convinced the U.S. Navy to place an initial order for fifty-four. The first F4F-3 rolled off the assembly line early in 1940.

The F4F-3 was first used by the British late in 1940. The following year, both the U.S. Navy and Marine Corps were flying *Wildcats*, with 187 being used by the navy alone at the time of the Japanese attack on Pearl Harbor.

Opposite: **Diorama of U.S. Navy *Wildcats* providing protective fighter cover (CAP) at Midway. *Courtesy of the Smithsonian Air and Space Museum Library***

Below: **F4F-3 *Wildcats* from the *Enterprise* early in the war. Note the round insignia on the wings and fuselage. It would soon be replaced because of fears that it could be mistaken for the Japanese "meatball" insignia. *Courtesy of the U.S. Navy***



F4F-3 Evaluation:
Speed: good
Climbing: good
Maneuverability: fair
Gun firepower: good
Durability: excellent
Range: fair

Performance:
Engine: one Pratt & Whitney R-1830-76 (early); one Pratt & Whitney R-1830-86 (late)
Horsepower: 1,200
Top speed: 331 miles per hour
Rate of climb: 2,300 feet per minute
Ceiling: 37,000 feet
Range: 860 miles
Crew: one

Dimensions:
Wingspan: 38 feet
Wing area: 260 square feet
Length: 28 feet 9 inches
Height: 11 feet 4 inches

Weights:
Empty: 5,238 pounds
Loaded: 7,056 pounds
Wing loading: 33.6 pounds/square foot
Power loading: 7.3 pounds/horsepower

Armament:
Guns: four .50 caliber machine guns, two in each wing

Grumman F4F-3A *Wildcat* Carrier-Based Fighter

By late 1940, the U.S. Navy, concerned about production delays with the F4F-3's Pratt & Whitney R-1830-36 engine, placed an order with Grumman for a version that would use a different powerplant. Known as the F4F-3A, this model was identical to the F4F-3 in every respect, except that it featured a supercharged Pratt & Whitney R-1830-90 engine. This new engine was slightly less powerful than the R-1830-36, and pilots reported that the F4F-3A was slower and didn't handle as well as the F4F-3.

The F4F-3A was the first *Wildcat* to see action against Japan. In the battle at Wake Island, four F4F-3As attacked the Japanese invasion fleet, sinking a destroyer, and forcing the fleet to turn around. Eleven days later the fleet returned, but this time the few remaining *Wildcats* were no match for it, as Wake Island fell on December 23, 1941. F4F-3s and F4F-3As also participated in numerous engagements early in 1942, including the Battle of the Coral Sea.

"On September 15, we were pounding along when, BLAM! BLAM! BLAM! Three Japanese torpedoes delivered the death blow to the *Wasp*. I was trapped in the forecastle with two hundred men when the heat from the burning gasoline and explosions of the bombs in our planes on the hangar deck became too bad and we had to abandon ship. It was like losing a good friend..."

***Bureau of Aeronautics Newsletter*, December 1, 1942**

F4F-3A Evaluation:
Speed: fair
Climbing: fair
Maneuverability: fair
Gun firepower: good
Durability: excellent
Range: fair

Performance:
Engine: one Pratt & Whitney R-1830-90
Horsepower: 1,200
Top speed: 312 miles per hour
Rate of climb: 2,430 feet per minute
Ceiling: 34,300 feet
Range: 825 miles
Crew: one

Dimensions:
Wingspan: 38 feet
Wing area: 260 square feet
Length: 28 feet 9 inches
Height: 11 feet 4 inches

Weights:
Empty: 5,216 pounds
Loaded: 6,876 pounds
Wing loading: 27.1 pounds/square foot
Power loading: 5.8 pounds/horsepower

Armament:
Guns: four .50 caliber machine guns, two in each wing

Grumman F4F-4 *Wildcat*
Carrier-Based Fighter

Recognizing that the fixed wings of the F4F-3 and F4F-3A would severely limit the number of aircraft that could be stored on board an aircraft carrier, the U.S. Navy ordered a prototype F4F-3 with folding wings and two extra .50 caliber machine guns. This version of the *Wildcat,* the F4F-4, began to reach carrier squadrons after the Battle of the Coral Sea.

By the time of the Battle of Midway, the F4F-4 had completely replaced the F4F-3 and F4F-3A aboard U.S. carriers. It saw extensive action in the Battle of Midway, the Battle of the Eastern Solomons, the Battle of the Santa Cruz Islands, and in many other engagements. Even after the *Wildcat* had been replaced by the F6F *Hellcat,* it continued to play an important role in the Pacific campaign up until the end of the war.

In a one-on-one dogfight situation, the F4F-4 was no match for the Japanese *Zero* fighter, which was faster, more maneuverable, and had a higher ceiling and a longer range. However, by avoiding dogfights and pairing up in twos against a *Zero,* pilots of the *Wildcat* could take advantage of its superior firepower and its ability to withstand battle damage.

"Remember, we got a 1,000-pound hit on the flattop..."

Commander William Ault of the *Lexington,* just before he ditched his bomber, unable to find his carrier. He was later reported missing in action.

F4F-4 Evaluation:
Speed: good
Climbing: good
Maneuverability: good
Gun firepower: excellent
Durability: excellent
Range: fair

Performance:
Engine: one Pratt & Whitney R-1830-86 radial engine
Horsepower: 1,200
Top speed: 320 miles per hour
Rate of climb: 2,190 feet per minute
Ceiling: 34,000 feet
Range: 1,275 miles
Crew: one

Dimensions:
Wingspan: 38 feet
Wing area: 260 square feet
Length: 29 feet
Height: 11 feet 4 inches

Weights:
Empty: 5,895 pounds
Loaded: 8,765 pounds
Wing loading: 26.4 pounds/square foot
Power loading: 5.7 pounds/horsepower

Armament:
Guns: six .50 caliber machine guns, three in each wing

"Black objects suddenly floated eerily from their wings."

Commander Mitsuo Fuchida, aboard the *Akagi*, witnessing the American dive-bombing attack on his ship at Midway

Douglas SBD-2 *Dauntless* Carrier-Based Dive Bomber

Perhaps the most popular carrier aircraft of the Second World War among U.S. Navy pilots, the *Dauntless* was easy to fly, and deadly effective at delivering bombs. Otherwise known as the "Barge," the "Clunk," and the "Slow But Deadly," it played an important role in the carrier battles of 1942, especially at the Battle of Midway.

The earliest version of the *Dauntless* to be accepted by the U.S. Navy was the SBD-2. This model had a larger fuel capacity than the earlier SBD-1, but it lacked armor-plating and a bulletproof windshield. Even though it was not considered combat-worthy, it was in use aboard U.S. carriers at the time of Pearl Harbor. Seven SBD-2s from the *Enterprise* were shot down in the attack, while shooting down two Japanese aircraft.

Douglas SBD-3 *Dauntless* Carrier-Based Dive Bomber

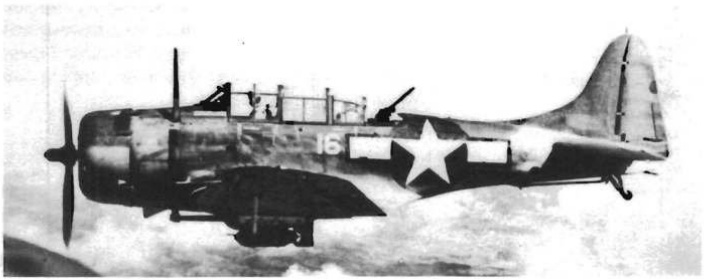
In March of 1942, the U.S. Navy began replacing its SBD-2s with SBD-3s. This new version was far more combat-worthy, with a more powerful engine,

SBD-2 Evaluation:
Speed: fair
Climbing: fair
Maneuverability: fair
Gun firepower: fair
Durability: excellent
Range: good
Performance:
Engine: Wright R-1820-32
Horsepower: 1,000 at take off
Top speed: 252 miles per hour
Rate of climb: 1,080 feet per minute
Ceiling: 27,400 feet
Range: 1,225 miles (bombing); 1,370 miles (scouting)
Crew: two
Dimensions:
Wingspan: 41 feet 6 inches
Wing area: 325 square feet
Length: 32 feet 2 inches
Height: 13 feet 7 inches
Weights:
Empty: 6,293 pounds
Loaded: 10,360 pounds
Wing loading: 31.8 pounds/square feet
Power loading: 10.3 pounds/horsepower
Armament:
Guns: one fixed .50 caliber machine gun, mounted in front of the cockpit, and one flexible .30 caliber machine gun, mounted in the rear of the cockpit
Warhead: one 1,000-pound bomb. Also could carry one of these combinations: two 100-pound bombs or depth charges plus one 500-pound bomb, or one 1,600-pound bomb.

extra machine guns, armor-plating around the crews and fuel tanks, and a bulletproof windshield.

The SBD-3 was the first *Dauntless* model to be widely produced and, after 1942, it would go down in history. Bombs dropped from SBD-3 *Dauntlesses* sank Japanese ships at the Battle of the Coral Sea and the Battle of the Eastern Solomons, in addition to four aircraft carriers at the Battle of Midway. It would continue to be the workhorse of the U.S. fleet throughout the entire Solomons campaign. The SBD-5 *Dauntless* and the SB2-C *Helldiver* replaced the SBD-3 in 1943.

SBD *Dauntless* dive bombers covering the invasion of Saipan in the Marianas. *Courtesy of the U.S. Navy*



SBD-3 Evaluation:
Speed: fair
Climbing: fair
Maneuverability: fair
Gun firepower: good
Durability: excellent
Range: good

Performance:
Engine: Wright R-1820-52
Horsepower: 1,000 at take off
Top speed: 250 miles per hour
Rate of climb: 1,190 feet per minute
Ceiling: 27,400 feet
Range: 1,345 miles (bombing); 1,580 miles (scouting)
Crew: two

Dimensions:
Wingspan: 41 feet 6 inches
Wing area: 325 square feet
Length: 32 feet 8 inches
Height: 13 feet 7 inches

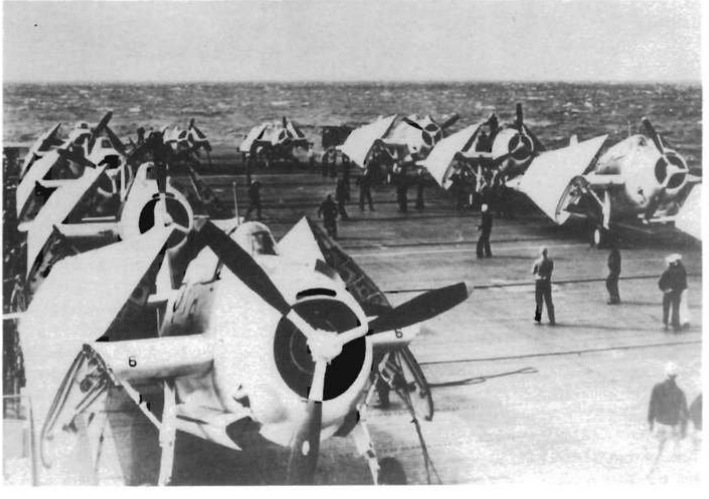
Weights:
Empty: 6,345 pounds
Loaded: 10,400 pounds
Wing loading: 32 pounds/square feet
Power loading: 10.4 pounds/horsepower

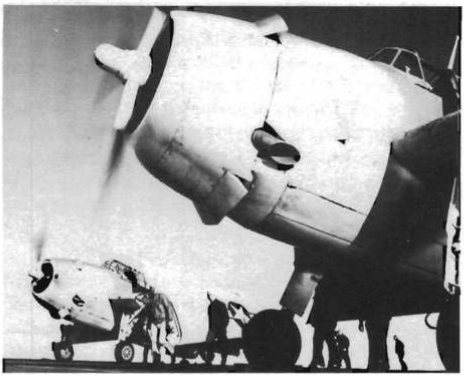
Armament:
Guns: two .50 caliber forward-firing machine guns, mounted in front of the cockpit, plus two .30 caliber flexible machine gun at the rear of the cockpit
Warhead: one 1,000-pound bomb. Also could carry one of these combinations: two 100-pound bombs or depth charges plus one 500-pound bomb, or one 1,600-pound bomb.

Grumman TBF-1 *Avenger* Carrier-Based Torpedo Bomber

Sometimes known as the "Turkey" or "Pregnant Beast," the rugged, reliable *Avenger* proved to be a far superior replacement for the slow, obsolete TBD-1 *Devastator,* which failed so disastrously at Midway. The TBF-1 saw its first action as a land-based bomber in that battle, and replaced the *Devastator* on carriers soon after. *Avengers* later participated in the Battle of the Eastern Solomons and the Battle of the Santa Cruz Islands, and played valuable roles in other major naval engagements through-out the war. In 1944, *Avengers* scored four torpedo hits against the Japan-ese battleship *Yamato*, the most heavily-armed vessel in the world. *Avengers* were also used extensively and effectively against Japanese shipping and in anti-submarine duty.

With their "sto-wings" folded, a squadron of TBF *Avengers* wait for their next mission. *Courtesy of the U.S. Navy*





TBF *Avengers* taxiing up a carrier's flight deck after landing. ***Courtesy of the U.S. Navy***

The TBF-1 proved to be a very sturdy platform from which to launch a torpedo. It was heavily armored, so it could sustain a good deal of damage from fighters while in the air. With machine guns located in the front of the canopy, in the power turret in the rear, and in the underside of the aircraft, it could also unleash a good deal of damage.

TBF-1 Evaluation:
Speed: good
Climbing: good
Maneuverability: fair
Gun firepower: excellent
Durability: excellent
Range: good

Performance:
Engine: one Wright R-2600
Horsepower: 1,700
Top speed: 257 miles per hour
Rate of climb: 1,430 feet per minute
Ceiling: 21,400 feet
Range: 1,215 miles
Crew: three

Dimensions:
Wingspan: 54 feet 2 inches
Wing area: 490 square feet
Length: 40 feet
Height: 16 feet 5 inches

Weights:
Empty: 10,080 pounds
Loaded: 13,667 pounds
Wing loading: 27.8 pounds/square foot
Power loading: 8 pounds/horsepower

Armament:
Guns: one forward-firing .30 caliber machine gun, one .30 caliber machine gun in the belly, and one .50 caliber machine gun in the power turret at rear of canopy
Warhead: one 500-pound MK13 torpedo. Also could carry one of these combinations: one 2,000-pound general purpose bomb, two 1,000-pound general purpose bombs, four 500-pound general purpose bombs, one 1,600-pound armor-piercing bomb, or four 350-pound depth bombs.

Japanese Airborne Weapons

7.7 mm Machine Gun

Two major variations of this light machine gun were used in Japanese carrier planes. The forward-firing Type 97 was fixed to the engine cowling of the *Zero* and *Val*. The flexible-mounted Type 92 was used by the rear gunners of the *Val* and *Kate*. It took many bullets from these guns to damage the sturdy American planes. *Zero* pilots used them for ranging — once they were hitting the target accurately, the more powerful cannons were used.

20 mm Cannon

This wing-mounted weapon on the *Zero* was powerful at close range. But, with a limited magazine of sixty shells, it ran out of ammunition quickly. It also had a low muzzle velocity, meaning that the bullets would travel slowly once they left the cannon. This made it difficult to hit a moving target effectively.

250-kilogram Bombs

These "iron bombs" were packed with high explosives, and were used by the *Val* for dive-bombing ships and land targets. Often, a near-miss on a ship with one of these bombs was as effective as a hit because the explosion in the water could breach the hull below the waterline, much like a torpedo.

Type 95 Torpedo

Otherwise known as the "Long Lance," this was the best torpedo in the world at the time, far outclassing any U.S. torpedo. It could be dropped from a bomber at a height of 500 feet above the ocean, and would speed to its target at an incredible 45 knots. Its warhead weighed 900 pounds and would nearly always explode when it hit the target, unlike U.S. torpedo warheads.

United States Airborne Weapons

.30 Caliber Machine Gun

Similar to the Japanese 7.7 mm guns, this 7.6 mm gun was used by rear gunners on the SBD *Dauntless* and TBF *Avenger*, where it could prevent a *Zero* pilot from executing his favorite tactic — a tail attack. It came in single barrel and double barrel varieties.

.50 Caliber Machine Gun

This gun measured 12.7 mm, and could do heavy damage to the Japanese planes, which lacked self-sealing fuel tanks and armor-plating. The incendiary tracer bullets would sometimes cause a *Zero* to explode if they hit its gas tank. It was the main forward gun on the F4F *Wildcat*, the SBD *Dauntless*, and the TBF *Avenger*.

Rear gunner of an SBD *Dauntless* dive bomber. Since Japanese *Zero* fighter pilots were especially fond of tail attacks, this man usually had his hands full! *Courtesy of Franklin Avery*

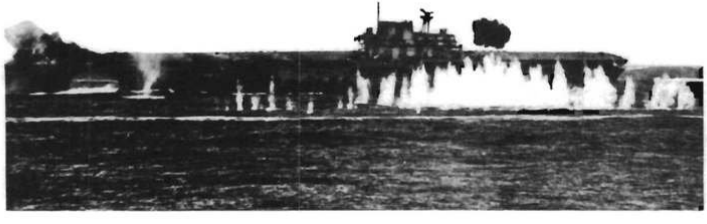
500/1,000-pound Bombs

Like their Japanese counterparts, these were high-explosive "iron bombs" which could be used against land and sea targets. The SBD carried either type, usually the larger 1,000-pounder. When there was insufficient deck space on the carrier for a long take off, the 500-pound bomb was used to lighten the load and shorten the take off distance.

Mark 13 Torpedo

Perhaps one of the most unreliable weapons ever devised, the Mark 13 was slow, inaccurate, and often defective. Its fragile guidance system would go haywire if it hit the water at a high speed or at an angle that wasn't perfectly flat. With its sluggish speed of 33.5 knots, it could sometimes be deliberately detonated by machine gun bullets. If it did hit the target, its 500-pound warhead often failed to explode.

Japanese and American Warships: 1942



Japanese Warships

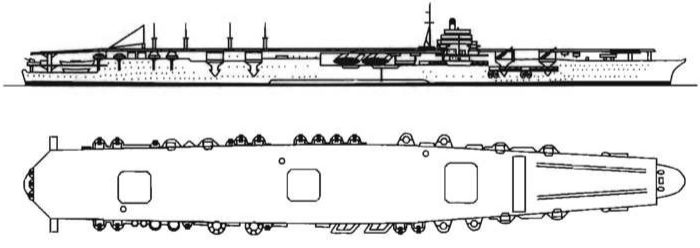
Aircraft Carriers

Akagi Class

Converted from the hull of a partially-built battlecruiser, the *Akagi* was completed as an aircraft carrier in March of 1927. In 1938, the *Akagi* was modernized, with the addition of a full flight deck and an island on its port side.

The heavily-armored *Akagi* was an important part of the Imperial Japanese Navy's carrier strike forces, and participated in the campaigns at China, Pearl Harbor, Rabaul, Darwin, Java, and Ceylon. On June 4, 1942, the *Akagi* was seriously damaged by planes from the *Enterprise* off Midway Island, and was scuttled by destroyers the following day.

Number of ships in class: 1 — Length: 855 feet
Beam: 102 feet 9 inches — Draft: 28 feet 7 inches
Displacement: 36,500 tons — Shaft horsepower: 133,000
Top speed: 31 knots — Crew: 2,000
Armament: six 8-inch .50 caliber guns, twelve 4.7-inch .45 caliber guns, twenty-eight 25 mm anti-aircraft guns
Number of aircraft: 91



Side and top view of the Japanese carrier *Shokaku* — a U.S. nemesis throughout much of the war.

Shokaku Class

Completed on August 8, 1941, the *Shokaku* and its sister ship, the *Zuikaku*, were part of a new Japanese Navy class of "supercarriers." The two fast carriers played an important role in many of the battles in the Pacific, including attacks on Pearl Harbor, Rabaul, Darwin, Java, and Ceylon. On May 7, 1942, the

Shokaku was heavily damaged by U.S. planes from the carriers *Lexington* and *Yorktown* at the Battle of the Coral Sea. As a result, it was laid up for repairs and missed the critical Battle of Midway.

The *Shokaku* returned to action in the Battle of the Eastern Solomons. It was damaged at the Battle of the Santa Cruz Islands, and knocked out of action for the next nine months. On June 19, 1944, the *Shokaku* was sunk by the U.S. submarine *Cavalla* off Yap Island.

Number of ships in class: 2 Length: 844 feet
Beam: 85 feet 4 inches Draft: 29 feet 1 inch
Displacement: 25,675 tons Shaft horsepower: 160,000
Top speed: 34 knots Crew: 1,660
Armament: sixteen 5-inch .40 caliber dual-purpose guns, forty-two 25 mm anti-aircraft guns
Number of aircraft: 84

Soryu Class

While not as large as the *Akagi* or *Kaga*, the *Soryu* and its sister ship, the *Hiryu*, were faster, more maneuverable, and more powerful than the bigger carriers. Both the *Soryu* and *Hiryu* were built along roughly the same lines, with the *Hiryu* weighing slightly more and having somewhat larger dimensions. Interestingly, the *Soryu*'s island was on its port side, while the *Hiryu*'s was on its starboard side.

The *Soryu* was completed in 1937, and the *Hiryu* in 1939. Both carriers took part in the engagements

After being attacked by U.S. dive bombers at the Battle of Midway, the carrier *Kaga* was burning, dead in the water. The U.S. submarine *Nautilus* followed the *Kaga* for nearly three hours, then tried to finish the carrier off with three torpedoes. Two of the "fish" missed, but the third hit the hull of the *Kaga*, then broke in half without exploding. The warhead sank, but the body bobbed up to the surface among a group of sailors who had gone overboard to escape the flames. Several of them clutched the torpedo like a life raft. One even straddled and rode it like a horse, providing perhaps the only laugh that these men would have all day.

at China, Pearl Harbor, Wake Island, Rabaul, Ambon Island, Timor, Darwin, Java, and Ceylon. On June 4, 1942, the *Soryu* was attacked and sunk by dive bombers from the *Yorktown* at the Battle of Midway. That same day, the *Hiryu* was badly damaged by aircraft from the *Yorktown* and *Enterprise*, and was scuttled the next day.

Number of ships in class: 2
Length: 746 feet
Beam: 69 feet 11 inches
Draft: 25 feet
Displacement: 18,800 tons
Shaft horsepower: 152,000
Top speed: 34 knots
Crew: 1,100
Armament: twelve 5-inch .40 caliber guns, twenty-eight 25 mm anti-aircraft guns
Number of aircraft: 71

Kaga Class

Like the *Akagi*, the *Kaga* was built on the hull of an unfinished battlecruiser. Both of these huge carriers had horizontal funnels, and smoke was constantly seeping into the crew's quarters. Nevertheless, the *Kaga* and the *Akagi* were favorites of the Japanese Navy.

The *Kaga* was completed in 1928, and modernized to hold more aircraft in 1935. After seeing service at China, Pearl Harbor, Rabaul, Darwin, and Java, the *Kaga* was sunk on June 4, 1942, by dive bombers from the *Enterprise* at the Battle of Midway.

There were many reasons why damaged vessels on both the Japanese and the American side were deliberately sunk, or scuttled. If they were abandoned, then remained afloat, they could be captured by the enemy. Any weapons, materials, or secret codes or communications found on board would be invaluable. Also, the captured vessel could be repaired, and then used in battle against its makers. Plus the capture of a prized, though damaged, vessel could be bad for the morale of the side that lost the ship. After the Battle of Midway, Admiral Yamamoto's staff, pondering the fate of the *Akagi*, thought that if they abandoned the carrier, "...the Americans would come in and take her and she would be a museum piece in the Potomac River." Finally, Yamamoto himself gave the order to scuttle the *Akagi*.

Number of ships in class: 1 Length: 812 feet
Beam: 106 feet 8 inches Draft: 31 feet 1 inch
Displacement: 38,200 tons Shaft horsepower: 127,000
Top speed: 28 knots Crew: 1,340
Armament: sixteen 5-inch .40 caliber guns, ten 8-inch .50 caliber guns, twenty-two 25 mm anti-aircraft guns
Number of aircraft: 90

Ryujo Class

With its distinctive high bow and low stern, the *Ryujo* was one of the smaller ships in the Japanese Navy. It was completed in 1933 and reconstructed in 1936. After seeing service in China, the Philippines, the East Indies, and the Indian Ocean, the *Ryujo* was part of the task force that made a diversionary raid on the Aleutians on June 3, 1942, the day before the Battle of Midway.

Later that year, the *Ryujo* was sunk at the Battle of the Eastern Solomons by planes from the *Saratoga*.

Number of ships in class: 1 Length: 590 feet
Beam: 68 feet 2 inches Draft: 23 feet 3 inches
Displacement: 10,600 tons Shaft horsepower: 66,269
Top speed: 29 knots Crew: 924
Armament: eight 5-inch .40 caliber guns, twenty-four 13.2 mm anti-aircraft guns, four 25 mm anti-aircraft guns
Number of aircraft: 48

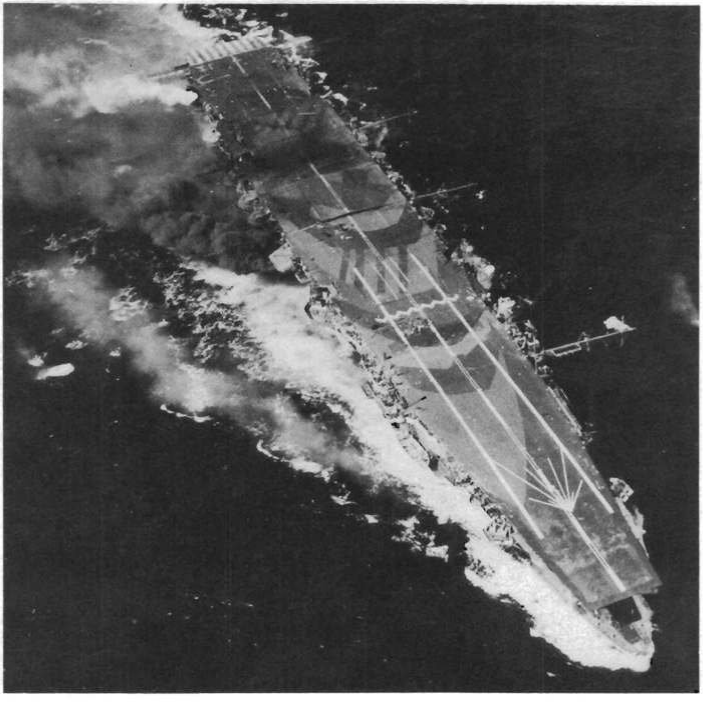
Shoho Class

The *Shoho* and its sister ship, the *Zuiho*, were originally built as submarine support ships, and were later converted to aircraft carriers. The slightly-larger *Zuiho* was reconstructed in 1940, and the *Shoho* in 1942.

In its only battle, the *Shoho* was sunk by planes from the *Yorktown* in the Battle of the Coral Sea on May 7, 1942. The *Zuiho* enjoyed a longer career, seeing action in the Philippines and the Aleutians before being damaged in the Battle of the Santa Cruz Islands. After repairs, the *Zuiho* took part in the Bat-

"Don't let another day like this come to us again during the course of this war! Let this day be the only one of the greatest failures of my life."

Admiral Chuichi Nagumo, after losing four carriers on June 4, 1942, at the Battle of Midway



Hit by bombs and torpedoes from U.S. Navy aircraft, the Japanese carrier *Zuiho* maneuvers frantically to evade its attackers. Note the large gun turrets painted on the flight deck to make the carrier look like a battleship. *Courtesy of the U.S. Navy*

tle of the Philippine Sea before being sunk off Cape Engano in the Battle of Leyte Gulf.

Number of ships in class: 2
Length: 674 feet
Beam: 59 feet 8 inches
Draft: 21 feet 7 inches
Displacement: 11,262 tons
Shaft horsepower: 52,000
Top speed: 28 knots
Crew: 989
Armament: eight 5-inch .40 caliber guns, eight 25 mm anti-aircraft guns
Number of aircraft: 30

Furutaka Class

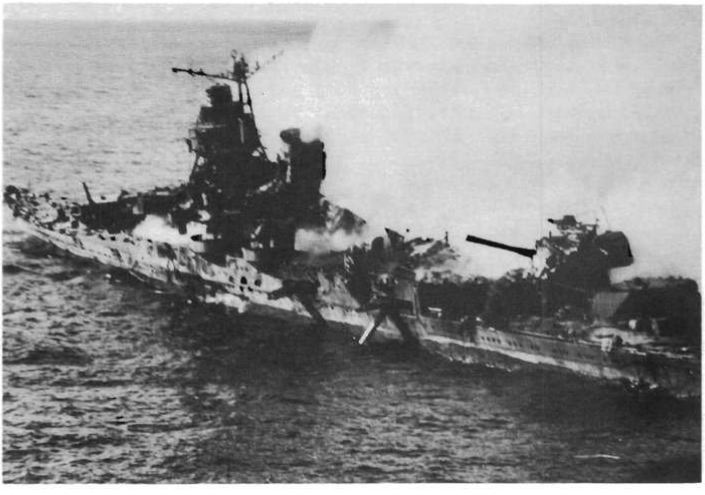
The first Japanese cruiser designed and built to comply with the 1925 Washington Treaty, which limited warship size, the *Furutaka* was completed in 1926 and modernized in 1939. It saw action in the Battle of the Coral Sea and at the Battle of Savo Island, near Guadalcanal. The *Furutaka* was sunk in October, 1942, by the cruisers *Salt Lake City* and *Boise* at the Battle of Cape Esperance.

Number of ships in class: 2 Length: 607 feet
Beam: 51 feet 9 inches Draft: 18 feet 3 inches
Displacement: 7,100 tons Shaft horsepower: 102,000
Top speed: 34.5 knots Crew: 625
Armament: six 8-inch .50 caliber guns, four 3-inch .40 caliber guns, ten MGs, twelve 24-inch torpedo tubes
Number of aircraft: 1

Mogami Class

Originally designed as light cruisers, the *Mogami*, along with her sister ships *Mikuma, Suzuya,* and *Kumano*, were rearmed as heavy cruisers before the outbreak of war with the U.S. The *Mogami* was constructed in 1935 and rebuilt in 1938. In the Battle of Midway, the *Mogami* was heavily damaged, both by aircraft from the *Enterprise* and in a collision with the *Mikuma*. After extensive repairs, and modifications for seaplane carrying, the *Mogami* was again severely damaged, this time off Rabaul in 1943. In 1944, the *Mogami* was finally sunk in the Battle of Leyte Gulf by U.S. cruisers.

Number of ships in class: 4 Length: 649 feet 10 inches
Beam: 63 feet Draft: 19 feet 4 inches
Displacement: 11,200 tons Shaft horsepower: 152,000
Top speed: 35 knots Crew: 850
Armament: fifteen 155 mm .60-caliber guns, eight 127 mm .40 caliber guns, eight 25 mm anti-aircraft guns, four 13.2 mm anti-aircraft guns, four racks of three 610 mm torpedo tubes
Number of aircraft: 3



A U.S. Navy bomber crashes into the Japanese heavy cruiser *Mikuma* during the Battle of Midway. The badly-damaged warship later went to the bottom. *Courtesy of the U.S. Navy*

Tone Class

Completed in 1938, the *Tone*, along with its sister ship the *Chikuma*, took part in the Battle of Midway. There, the *Tone*'s defective seaplane catapult delayed the launch of a reconnaissance plane and prevented the U.S. fleet from being discovered until it was too late. The *Tone* was later sunk by U.S. aircraft off the coast of Japan near Kure in 1945.

Number of ships in class: 2	Length: 649 feet 7 inches
Beam: 60 feet 8 inches	Draft: 21 feet 3 inches
Displacement: 11,215 tons	Shaft horsepower: 152,000
Top speed: 35 knots	Crew: 850

Armament: eight 8-inch .50-caliber guns, eight 5-inch .40 caliber guns, twelve 25 mm anti-aircraft guns, four racks of three 610 mm torpedo tubes
Number of aircraft: 5

Fubuki Class

The oldest class of Japanese destroyers to serve in the Pacific war, *Fubuki* class destroyers were the first in the world to have guns in enclosed mountings.

Date of construction: 1926-1928
Number of ships in class: 20 — Length: 378 feet 3 inches
Beam: 34 feet — Draft: 10 feet 6 inches
Displacement: 1,750 tons — Shaft horsepower: 50,000
Top speed: 38 knots — Crew: 197
Armament: six 5-inch .50-caliber guns, two 13 mm anti-aircraft guns, nine 24-inch torpedo tubes, eighteen torpedoes, eighteen mines, eighteen depth charges

Hatsuharu Class

This class of destroyers was designed as an improvement on the *Fubuki* class, and had lighter armament.

Date of construction: 1931-1935
Number of ships in class: 6 — Length: 359 feet 3 inches
Beam: 32 feet 9 inches — Draft: 9 feet 11 inches
Displacement: 1,490 tons — Shaft horsepower: 42,000
Top speed: 36 knots — Crew: 200
Armament: five 5-inch .50-caliber guns, two 13 mm anti-aircraft guns, nine 24-inch torpedo tubes, fourteen depth charges

Kagero Class

Slightly larger and more powerful than the *Fubuki* or the *Hatsuharu* classes, the *Kagero* class was known as a cruiser-type destroyer.

Date of construction: 1937-1941
Number of ships in class: 18 — Length: 388 feet 9 inches
Beam: 35 feet 5 inches — Draft: 12 feet 4 inches
Displacement: 2,033 tons — Shaft horsepower: 52,000
Top speed: 35 knots — Crew: 240
Armament: six 5-inch .50-caliber guns, four 25 mm anti-aircraft guns, eight 24-inch torpedo tubes, sixteen depth charges

After the Battle of Midway, the *Yorktown*, dead in the water, was abandoned. The next day an escorting destroyer, the *Hughes*, heard a blast of machine gun fire coming from the stricken carrier. A search party was sent over to investigate, and found Seaman Second Class Norman Pichette on board. Suffering from severe abdominal wounds, Pichette had pulled himself up from three decks below, and fired a machine gun at the *Hughes* to attract attention. The wounded sailor told the search party that another man was still alive in the sick bay. Soon afterward, Pichette died, but thanks to his actions, the man in the sick bay survived.

Yugumo Class

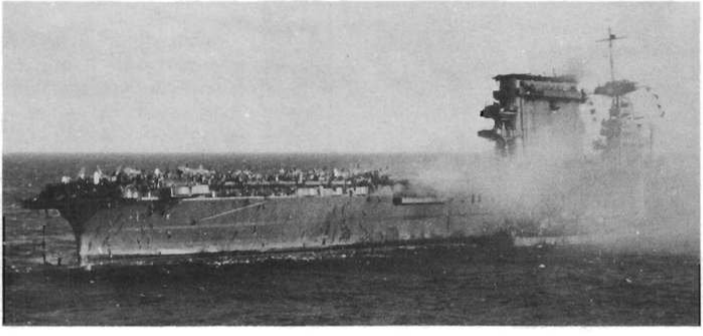
This class of destroyer was developed as an improvement to the *Kagero* cruiser-type.

Date of construction: 1940-1945
Number of ships in class: 20 Length: 390 feet 11 inches
Beam: 35 feet 5 inches Draft: 12 feet 4 inches
Displacement: 2,077 tons Shaft horsepower: 52,000
Top speed: 35 knots Crew: 228
Armament: six 5-inch .50-caliber guns, four 25 mm anti-aircraft guns, eight 24-inch torpedo tubes, thirty-six depth charges

Lexington Class

The *Lexington*, and its sister ship the *Saratoga*, were the oldest carriers in the U.S. fleet at the time of the Pacific war. They were also the longest. Originally designed and partially-constructed as battlecruisers, they were completed as aircraft carriers in 1927.

The *Lexington* was the first U.S. aircraft carrier to be lost in action, following attacks by aircraft from the *Shokaku* and *Zuikaku* at the Battle of the Coral Sea in 1942. The *Saratoga* was damaged so many times during the course of the Pacific war that the Japan-ese listed it as sunk on several occasions. The big carrier participated in numerous engagements, including the Battle of the Eastern Solomons, and the invasions at Bougainville, the Gilbert Islands, Kwajalein, Eniwetok, and Iwo Jima.



The Battle of the Coral Sea, May, 1942. Following the order to abandon ship, the crew of the *Lexington* slides down ropes to be rescued by small boats. Barely visible to the right is a destroyer, whose crew are evacuating the sick and wounded. *Courtesy of the U.S. Navy*

Number of ships in class: 2
Length: 888 feet
Beam: 105 feet 6 inches
Draft: 24 feet 2 inches
Displacement: 33,000 tons
Shaft horsepower: 180,000
Top speed: 34 knots
Crew: 1,900
Armament: eight 8-inch .55 caliber guns, twelve 4-inch .25 caliber anti-aircraft guns
Number of aircraft: 81

Yorktown Class

The *Yorktown*, and its sister ship the *Enterprise*, were among the first ships designed and built exclusively as aircraft carriers. The *Yorktown* was commissioned in 1937, and the *Enterprise* in 1938. Both of these carriers were renowned for their speed and their ability to take heavy punishment, and their design inspired the later *Essex*-class carrier.

With only seven aircraft carriers in service when war broke out, the *Yorktown* and *Enterprise* saw a great deal of action early on. The *Yorktown* was damaged in the Battle of the Coral Sea, and was sunk by a Japanese submarine at the Battle of Midway. The *Enterprise* participated in nearly every major action in the Pacific war, including the Doolittle raid on Tokyo and the Battle of Midway. In both the Battle of the Eastern Solomons and the Battle of the Santa Cruz Islands, the *Enterprise* was heavily damaged. After repairs, the *Enterprise* supported numerous island invasions, and participated in the Battle of the Philippine Sea and the Battle of Leyte Gulf.

Number of ships in class: 2 Length: 809 feet 6 inches
Beam: 83 feet 3 inches Draft: 21 feet 8 inches
Displacement: 19,900 tons Shaft horsepower: 120,000
Top speed: 34 knots Crew: 2,072
Armament: eight 5-inch .38-caliber guns, sixteen 1.1-inch anti-aircraft guns
Number of aircraft: 81

Hornet Class

The only carrier in its class, the *Hornet* was a modified *Yorktown*-class design. Commissioned just before Pearl Harbor, the *Hornet* enjoyed a distinguished, though brief, career. It launched the B-25s which bombed Tokyo in the Doolittle raid, and participated in the Battle of Midway. The *Hornet* was finally sunk by Japanese planes and destroyers at the Battle of the Santa Cruz Islands.

Number of ships in class: 1 Length: 809 feet 6 inches
Beam: 83 feet 3 inches Draft: 21 feet 8 inches
Displacement: 20,000 tons Shaft horsepower: 120,000
Top speed: 34 knots Crew: 2,072
Armament: eight 5-inch .38-caliber guns, sixteen 1.1-inch anti-aircraft guns
Number of aircraft: 81

Above: **April, 1942. As the carrier *Hornet* launches bombers in the Doolittle Raid on Tokyo, an F4F *Wildcat* from the carrier *Enterprise* provides protective fighter cover. This photograph was taken from the *Enterprise*. *Courtesy of the U.S. Navy***

Opposite: **Diorama showing torpedos from the Japanese submarine *I-168* ripping into the carrier *Yorktown* and the destroyer *Hammann* during the Battle of Midway. *Courtesy of the Smithsonian Air and Space Museum Library***

Heavy Cruisers

Astoria Class

Commissioned between 1934 and 1937, the seven heavy cruisers of the *Astoria* class were more heavily protected than earlier versions. Between 1940 and 1941, they were modified, with additional armor-plating added and anti-aircraft batteries strengthened.

Astoria-class cruisers saw action in the Battle of the Coral Sea, the Battle of Midway, and the Battle of the Eastern Solomons. Three *Astoria*-class cruisers, including the *Astoria* itself, were sunk at the Battle of Savo Island on August 9, 1942.

Number of ships in class: 7	Length: 588 feet
Beam: 61 feet 9 inches	Draft: 19 feet 5 inches
Displacement: 9,950 tons	Shaft horsepower: 107,000
Top speed: 32 knots	Crew: 700

Armament: nine 8-inch .55 caliber guns, eight 5-inch .25 caliber anti-aircraft guns

Atlanta Class

Smaller than the *Astoria*-class cruisers, the sleek *Atlanta*-class cruisers were among the fastest cruisers in the world at that time. Commissioned between 1941 and 1943, they were used mainly to provide anti-aircraft defense for aircraft carriers. The *Atlanta* itself, along with a sister ship, the *Juneau*, was lost off Guadalcanal in November, 1942.

Number of ships in class: 11	Length: 541 feet
Beam: 52 feet 10 inches	Draft: 20 feet
Displacement: 6,000 tons	Shaft horsepower: 75,000
Top speed: 33 knots	Crew: 700

Armament: sixteen 5-inch .38 caliber guns, 20 and 40 mm anti-aircraft guns, eight 21-inch torpedo tubes

McCall Class

Commissioned between 1938 and 1939, the *McCall*-class destroyer broke speed records during trial runs, averaging over 40 knots.

Number of ships in class: 12 — Length: 341 feet 3 inches
Beam: 34 feet 10 inches — Draft: 9 feet 10 inches
Displacement: 1,500 tons — Shaft horsepower: 42,800
Top speed: 36 knots — Crew: 200
Armament: four 5-inch .38 caliber guns, four 1.1-inch anti-aircraft guns, sixteen 21-inch torpedo tubes

Sims Class

The last of the single-stack destroyers, the *Sims* class was slightly more powerful than the *McCall* class. Commissioned between 1939 and 1940, all *Sims*-class destroyers had additional guns and armor-plating installed in 1941. The *Sims* itself was sunk in the Battle of the Coral Sea on May 7, 1942.

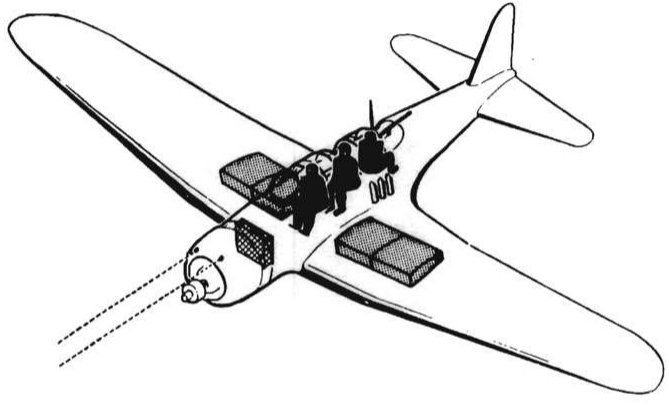
Number of ships in class: 12 — Length: 347 feet 11 inches
Beam: 35 feet 7 inches — Draft: 11 feet 6 inches
Displacement: 1,570 tons — Shaft horsepower: 50,000
Top speed: 37 knots — Crew: 200
Armament: five 5-inch .38 caliber guns, four 1.1-inch anti-aircraft guns, sixteen 21-inch torpedo tubes

"Going aboard a carrier? **Wondering what to take with you? The guys in the know say...**

1. **A waterproof flashlight with a blue lens.**
2. **A knife.**
3. **A whistle.**
4. **A waterproof money belt.**
5. **A compass."**

Bureau of Aeronautics Newsletter, **September 1, 1942**

Designer's Notes



by Lawrence Holland with Noah Falstein

In the spring of 1988, we began designing an air combat simulation. With so many combat/flight simulators available, you might ask why another one? We felt that very few flight simulators had captured the look and intensity of actual air combat so often seen in World War II newsreel footage. By taking a new direction, away from the line- and polygon-formed plane and ship images that are unconvincing and often unrecognizable, we arrived at a more visually-exciting game through the use of digitized images. The color and detail of these images creates a visually realistic experience.

Why World War II? Because modern air combat is abstracted. Nowadays, an F-14 fighter pilot sees a target on his radar at 100 miles range and fires a missile. If he's successful, a blip disappears from his screen. In World War II, the planes were less sophisticated, and the men who flew them did most of the work. Dogfight ranges were in hundreds, or even tens, of feet, not miles. The pilots of that era depended less on technology, and more on raw courage and skill.

Not everyone who served on a carrier got to taste the glory of aerial combat. ***Courtesy of the U.S. Navy***

Another reason we chose World War II for our simulation is that, unlike a hypothetical conflict, this war really happened. Even though a hypothetical conflict can be interesting, the enormous wealth of background material can make a historical simulation really come alive. We've been impressed with how accurately the views in *Battlehawks* match the World War II newsreel footage of the time. The major

difference is that the color in the game can make it more real than the film!

Why 1942? Because it was the pivotal year in the war between Japan and the United States. The outcome was still in the balance, and every mission was still important. In fact, the ten minutes in which U.S. dive bombers attacked three Japanese carriers at the Battle of Midway were probably the most critical ten minutes of the entire war. For *Battlehawks,* we chose those four battles that best illustrate this dramatic turnaround in the Pacific war.

To give balance to the game, we added the ability to fly as American or Japanese pilots. It helps in a war simulation to have some feeling for what the other side is going through, so you can experience the advantages and disadvantages of both nations' aircraft firsthand. In our research we were continually struck by the courage and dedication of the aviators on both sides. In 1942, the war was being fought by professionals, people who knew what they were facing, and often risked their lives knowing they probably wouldn't survive. The Japanese Naval commanders of the day entered the war reluctantly, faithfully serving their Emperor and the will of the people despite their concerns for the strength of the U.S. Navy and the powerful military production potential of the United States. U.S. commanders fought valiantly, often at first having to pit relatively green troops against veterans of the Japan-China battles. It was a time of honor and valor, and well worth remembering and reflecting upon.

Battlehawks 1942 is a kind of time machine. We've given you the ability to keep track of your service record to encourage role-playing. Imagine what that time was like, and try and put yourself in the shoes of the pilots, not just their planes. At its best, a simulation can be a living laboratory of the past. We hope you enjoy this one. Plans are underway for other exciting simulations from Lucasfilm Games.

"Heroes exterminate each other for the benefit of people who are not heroes."

Havelock Ellis

Bibliography

"All wars are popular for the first thirty days."

Arthur Schlesinger, Jr.

Aero Data International. *U.S. Navy Carrier Bombers of World War II*. Squadron/Signal Publications, 1987.

Brown, Eric. *Wings of the Navy*. Naval Institute Press, 1987.

Bureau of Aeronautics Newsletter. Bureau of Aeronautics, Issues 177, 181, and 183. Washington, D.C.: 1942.

Dickinson, Clarence. *The Flying Guns*. Charles Scribner's Sons, 1942.

Fahey, James. *The Ships and Aircraft of the United States Fleet, War Edition*. Ships and Aircraft, 1942.

Fahey, James. *The Ships and Aircraft of the United States Fleet, Victory Edition*. Ships and Aircraft, 1945.

Francillon, Rene. *Japanese Aircraft of the Pacific War*. Naval Institute Press, 1979.

Hoehling, A. A. *The Lexington Goes Down*. Prentice-Hall, 1971.

Hoyt, Edwin P. *Guadalcanal*. Stein and Day, 1981.

Jablonski, Edward. *Outraged Skies*. Doubleday & Company, 1971.

Karig, Walter, and Eric Purdon. *Battle Report, Pacific War, Middle Phase*. Rinehart and Company, 1947.

Keegen, John, ed. *The Rand McNally Encyclopedia of World War Two*. Rand McNally & Company, 1977.

Lord, Walter. *Incredible Victory*. Harper & Row, 1967.

Lundstrom, John B. *The First Team*. Naval Institute Press, 1984.

Macintyre, Donald. *Wings of Neptune*. W. W. Norton & Company, 1964.

Parsons, Iain, ed. *The Encyclopedia of Sea Warfare*. Salamander Books Limited, 1975.

Prange, Gordon W. *Miracle at Midway*. Penguin Books, 1982.

Reynolds, Clark G. *The Carrier War*. Time-Life Books, 1982.

Scrivner, Charles. *TBM/TBF Avenger in Action*. Squadron/Signal Publications, 1987.

Stern, Rob. *SBD Dauntless in Action*. Squadron/ Signal Publications, 1984.

Zich, Arthur. *The Rising Sun*. Time-Life Books, 1977.

Many of the photographs used in this manual were taken by Lieutenant Commander Clarence Avery (page 44), an SBD *Dauntless* dive bomber pilot who flew for the U.S. Navy during World War II. Commander Avery's squadron, VB-5, was based aboard the carrier *Yorktown*, which was commissioned shortly after its predecessor was sunk at the Battle of Midway. His squadron sank over 60,000 tons of Japanese shipping, and made dive-bombing raids on Wake Island, Kwajalein, Palau, and Truk, where Commander Avery was credited with hitting a Japanese cruiser and cargo ship. In one engagement, after his forward guns had jammed, he used his pistol to shoot the rear gunner of a Japanese torpedo bomber. Commander Avery was later awarded the Distinguished Flying Cross for his combat actions. Tragically, he survived the war only to be killed in a commercial plane crash in 1948.