

# 1942

## SIMULATION

### THE PACIFIC AIR WAR



## ***PILOT'S HANDBOOK***

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**1942 THE PACIFIC AIR WAR**  
PILOT'S HANDBOOK

MicroProse

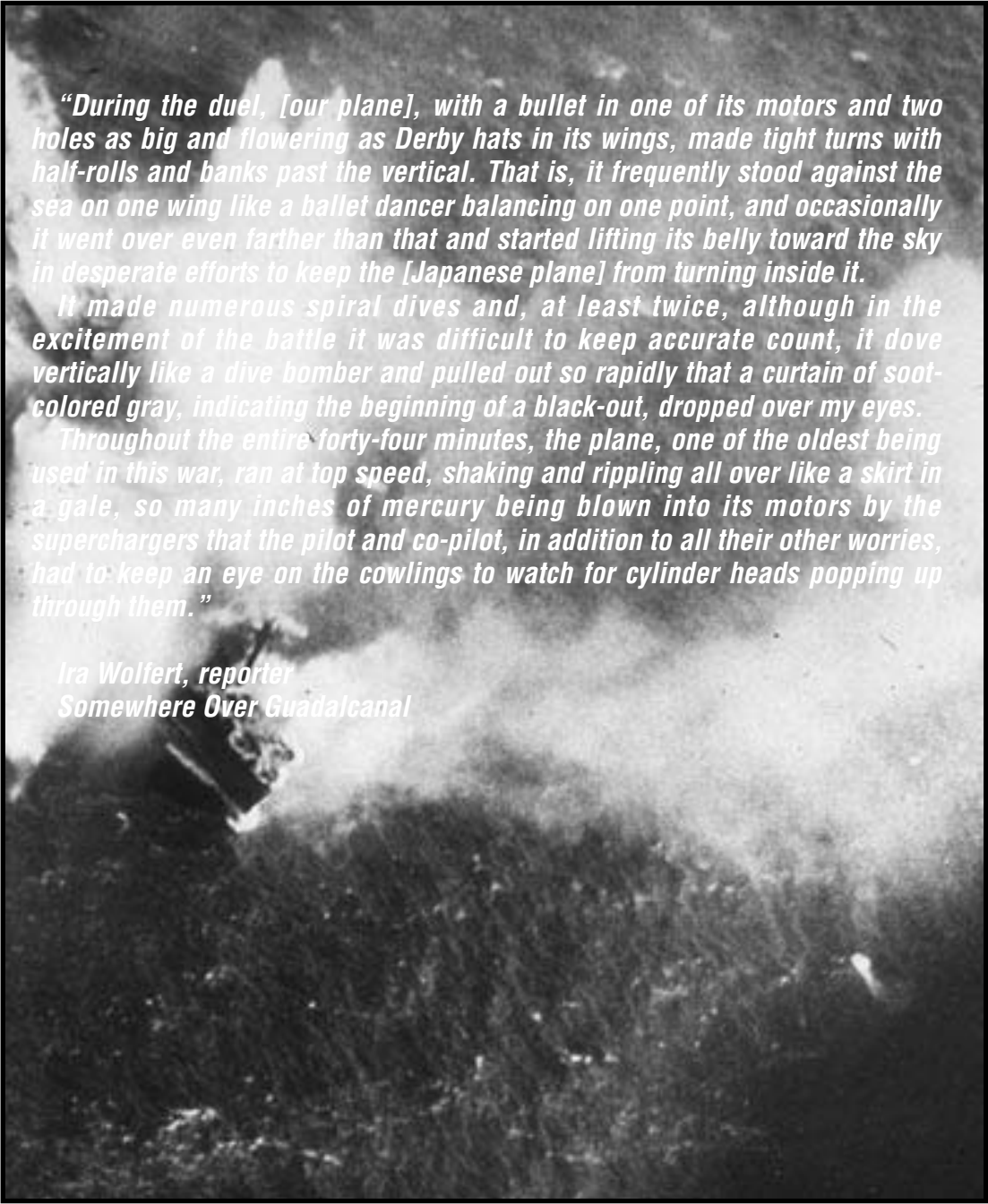
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*“During the duel, [our plane], with a bullet in one of its motors and two holes as big and flowering as Derby hats in its wings, made tight turns with half-rolls and banks past the vertical. That is, it frequently stood against the sea on one wing like a ballet dancer balancing on one point, and occasionally it went over even farther than that and started lifting its belly toward the sky in desperate efforts to keep the [Japanese plane] from turning inside it.*

*It made numerous spiral dives and, at least twice, although in the excitement of the battle it was difficult to keep accurate count, it dove vertically like a dive bomber and pulled out so rapidly that a curtain of soot-colored gray, indicating the beginning of a black-out, dropped over my eyes.*

*Throughout the entire forty-four minutes, the plane, one of the oldest being used in this war, ran at top speed, shaking and rippling all over like a skirt in a gale, so many inches of mercury being blown into its motors by the superchargers that the pilot and co-pilot, in addition to all their other worries, had to keep an eye on the cowlings to watch for cylinder heads popping up through them.”*

*Ira Wolfert, reporter  
Somewhere Over Guadalcanal*



# INTRODUCTION

Welcome to 1942, a great year to be a shark in the South Pacific. One of your primary goals in **1942 THE PACIFIC AIR WAR** is to avoid becoming shark food. The supplementary information in this book is intended to help you do just that – by staying airborne. Though skill and daring and marksmanship are extremely important factors in any aerial combat, it has been proven time and again that knowledge is the key to victory. When you know the enemy's strengths and weaknesses, you're ready to go into battle. When you know your own even better, you're ready to win.

This book, the **Pilot's Handbook**, contains a detailed flight tutorial, historical background for the campaigns and missions, statistics on all of the aircraft you can pilot in **1942 THE PACIFIC AIR WAR**, and a few basic combat strategies. Complete instructions on installing, running, configuring, and playing the game are in the **Game Player's Guide**. The **Keycard** is a one-stop reference to all of the keyboard, mouse, joystick, and other controls. The **Technical Reference** includes the hardware requirements for running the game and all of the software compatibility issues discovered before release. Any changes to the game that were made after this manual was written are also described in the **Technical Reference**. As always, the **Readme** file was written last, so any notations in that file supersede all other information.



# FLIGHT SCHOOL

This section is your flight instructor. Any of you who have extensive experience with piloting, especially combat flying, can probably skip over this part; you've been through flight school once already. The rest of you rookies better read up, read close, and pay attention. You can be sure that the enemy already knows all of what's here – and a lot more.

Despite the differences in design between the several models of aircraft included in **1942 THE PACIFIC AIR WAR** (These differences are discussed in detail in the subsection entitled “**The Cockpits**”), there are some features of flight that remain consistent across the board. It is your responsibility as a pilot to familiarize yourself with the essential basics of flight before you even think of getting into one of your navy's expensive aircraft.

## THE BASICS

Those of you who think you know something about flying might find some of these lessons overly simplified. Read them anyway. You won't have this book with you in combat (even if you do, wiseguy, you can't read and fly at the same time), and your life will depend on knowing more and being more skilled than your enemy. Besides, you might learn something.

## **ESSENTIAL AERODYNAMICS**

This is the physics lecture, but don't nod off yet. You really need to know this stuff. Literally hundreds of green pilots have lost their lives because they thought they knew how their plane would react. The only way (let me stress that – the **ONLY** way) to really be in control of your aircraft is to understand the forces acting on it and the way the control surfaces manipulate those forces. You don't need to memorize Bernoulli's equation, but you'd better understand what it means for your wings. The pilot who has the aerodynamics ingrained in his head can overcome virtually any enemy, including the "ace-killer", an uncontrolled spin.

### ***The Five Forces***

There are five basic physical forces that you have to worry about when you're flying a propeller-driven aircraft. Most textbooks say four, but they're wrong. If you don't know about torque, you'll end up like the many inexperienced pilots whose careers (and, too often, their lives) were ended trying to land the Vought F4u Corsair – the legendary "Ensign Eliminator".

**Gravity** is easy to understand; you deal with it every day. Your plane and everything in it are attracted to the surface of the Earth. The more weight (technically, mass) is on your plane, the greater the attraction. If there were no other forces acting on your plane, gravity would pull it to the ground and keep it there.

**Drag** would limit how fast you would fall. In simple terms, drag is the resistance the air offers to anything trying to move through it. A moving aircraft with no force impelling it would quickly slow down and stop because of the drag of the air around it.

**Thrust** is how you force your plane through all that drag. The spinning propeller pushes air backward, which action results in Newton's equal and opposite reaction – a forward motion of the entire aircraft. Of course, this just makes you plummet faster.

**Lift** is what keeps you in the air. The aircraft's wings are designed to take advantage of a side effect of the law of conservation of energy. The curvature of the wing causes air to move faster going over the top of the wing than it does going under. The side effect is that this faster-moving air has a lower pressure than the slower air (the pressure is determined using Bernoulli's equation), and the difference in pressure between the bottom and top surfaces of the wing lifts it. When the lift on both wings is great enough, the plane is held aloft. With lift and thrust both working to counteract nature's attempts to keep your plane from moving, it flies.

**Torque** is twisting power. In an aircraft, the torque you need to worry about is caused by radial engines. These engines rotate in only one direction, and that direction coincides with the roll axis of the plane. Some of the torque generated by the engine's rotation is transferred to the body of the plane, which makes the plane try to rotate in the opposite direction as the engine (usually counterclockwise – to the pilot's left). If the pilot does not compensate for this (using the rudder), the torque will cause the plane to roll. This is especially dangerous at low airspeeds and when landing.

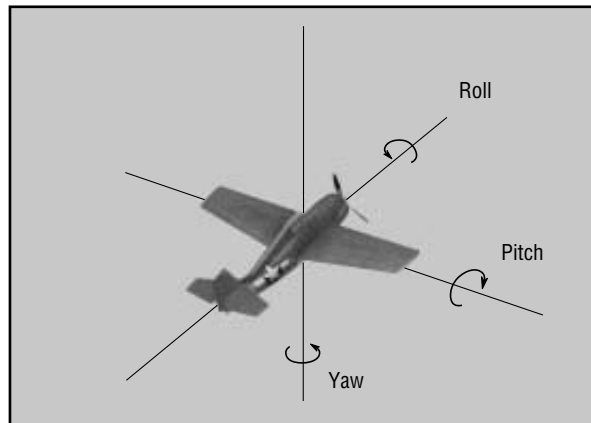
**Note:** Bernoulli's equation, as applied to the airflow around a wing (in case you really want to know) is:

$$P + 1/2\rho u^2 + \rho gy = K$$

That is, for any particular volume of air, the sum of its pressure (P), kinetic energy ( $1/2\rho u^2$ ), and potential energy ( $\rho gy$ ) stays constant (= K). Meaning, roughly, that the faster a volume of air moves, the lower its pressure.

### ***The Three Axes***

An aircraft can move in an essentially unlimited number of directions. For simplicity, however, we use a system of reference based on three axes of motion. By design, these axes correspond to the three main types of aircraft motion that you can control.



*Axes of Motion*

**Roll** is rotation of the plane around its length, also called the parallel horizontal axis.

**Pitch** is rotation of the plane around its transverse horizontal axis. The line formed by the wings is a good approximation of this axis.

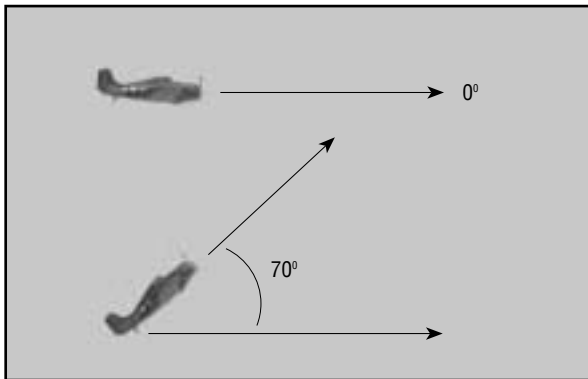
**Yaw** is rotation of the plane around its vertical axis. If you stuck a steel rod up through the belly of the plane and spun the plane around it, that would be yaw.

## Control Surfaces

Manipulating these basic forces is how you control the movement of your plane. Your engine provides the thrust, thus you have control over thrust. Two of the forces – drag and lift – do not act on all parts of the plane equally. Aircraft designers have taken advantage of that fact to build in features that let you control the plane. These features are called the “control surfaces”. Note that you do not have any control over gravity.

The **Propeller** is the surface you use to manipulate thrust. By varying the throttle setting, you cause the propeller to spin at different speeds. The faster it spins, the more forward thrust you have available.

**Elevators** are vertically-tilting sections of the horizontal part of the tail. Through drag, they affect the pitch of the plane. You control them with the forward and back movements of the stick. When the elevators are down (stick forward), the imbalance in the drag on the plane makes the nose tilt down. This is called “lessening the angle of attack”, and it causes the plane to dive. Up elevators, conversely, tilt the nose up, and the plane climbs.



*Angle of Attack*

You can use the **Wings**, indirectly, as a control surface to manipulate lift. When you change the plane’s angle of attack (using the elevators), the airflow over the wing changes. A greater angle of attack creates more lift – to a point. If this angle gets too big, and the plane’s airspeed is not high enough to maintain a smooth flow, turbulence will take away all of the lift. Without lift, the plane will stall and drop like a rock. A lesser angle of attack creates less lift.

The **Ailerons** are the control surface you will likely pay the most attention to. They’re like the elevators, only they’re on the wings. When you move the stick to either side, one aileron goes up and the other one goes down. Suddenly, one wing gains some extra lift, and the other one gets stuck with more drag. The former wing rises, while the latter drops. This motion is called “roll”. Your aircraft turns (banks) in the direction of the roll – the direction you moved the stick.



Built into the wings are **Flaps**, which you can extend or retract as necessary. These are used most often during landing, but they do have the occasional other purpose. Extending the flaps ("flaps down") has several results. First, lift is increased, so the plane rises; next, drag is also increased, so the plane slows. Overall (and this is most important), the flaps lower the speed at which the aircraft will stall. This means that, when landing, you can approach more slowly without stalling or, conversely, dive to a landing more steeply (because the flaps slow you), then "flare" – bring the nose up sharply just before touching down – and the flaps will kill most of your speed. Keep in mind that when you retract the flaps ("flaps up"), the plane will drop a bit. Some pilots use partial flaps for extra lift during take-off. If you are one of those, do not raise your flaps too soon after take-off, or you may find yourself at a negative altitude.

How much you use the **Rudder** depends on how soon you want to retire, and how violently. The rudder is a horizontally tilting section of the vertical part of the tail. Through drag, it affects the yaw of the plane, pointing the nose left or right. Not using the rudder enough will cause a rough ride and a very rough (if not violent) landing. Using the rudder too much or too often can quickly lead to your losing control of the plane. From there, it's a short downhill ride home.

**Brakes** come in two types. Dive Brakes (sometimes called Air Brakes) are a control surface. Wheel Brakes are like the brakes on a car, and they only work when you're on the runway. The dive brakes aren't built for fine control; they're either on or off. When on, they increase the drag on the aircraft, slowing the plane without causing any appreciable deflection from your course. When off, they have no effect at all.

### **Inertia**

All good pilots are aware of the effects of inertia on their aircraft and on their bodies. Pilots who do not understand inertia crash a lot. One definition of inertia is "the tendency of any object to resist a change to its state of motion". What that means is that if your body or your plane is sitting still, it wants to stay that way; if it is moving in a particular direction at a particular velocity, it wants to retain that speed and heading.

Inertia causes all sorts of trouble for pilots. Most importantly, it makes engines necessary. When starting your plane from a dead stop (at take-off, normally), you'll need much more throttle to accelerate than you will during flight. The engine has to overcome the inertia of the aircraft, which is trying to keep it still. While in flight, inertia makes maneuvers more difficult at higher speeds. The faster your plane is moving, the more inertia it has in the direction of movement. Thus, the engine and control surfaces have to do more work to get the plane to change direction.

*"We dove straight down so rapidly that my knees buckled under me.... Nobody knows how many times the weight of gravity was multiplied by that dive, everybody being too busy to notice. But I could feel my cheeks pull far down below my eyes and could feel my eyes sticking out of my head and my cheeks resting on my shoulders, and everything that was inside of me pressed into a bundle and forced into my lap."*

*Ira Wolfert, 1942,  
somewhere over the  
Solomons*

The most noticeable problem inertia causes is g forces. The 'g' is a standard abbreviation for acceleration due to gravity; in this case it is used to denote any acceleration experienced by the plane and pilot. Whenever you change direction, you are subject to g's. If you turn to the side (as in yawing or banking), you're putting a centripetal acceleration on the plane and your body. Inertia (often mistakenly called "centrifugal force") tries to keep you moving in your original direction, causing "transverse g's". When you turn downward, "negative g's" make you feel lighter, as in a dropping elevator. If you turn upwards, as in pulling out of a dive, "positive g's" push you into your seat. Positive and negative g's have risks – blackouts, greyouts, and redouts – which are described in the **Blackouts** subsection in **Flying A Mission**.

### **LEVEL FLIGHT**

Level flight is simply a matter of compensating for any predisposition the aircraft may have. For example, planes with radial engines tend to roll to one side, due to the excess torque inherent in the radial design. To fly straight and level, you need to counter the tendencies of your plane. A gentle hand on the stick and perhaps a little rudder is all it takes to maintain level flight. If you find it difficult to level your plane, the control surfaces (rudder, ailerons, and such) may have been damaged. Return to the carrier or base as soon as possible for repairs.

Pilots generally make level flight easier by setting the "trim" of the aircraft. Trimming is analogous to calibrating a joystick to center. You can "calibrate" the elevators to compensate for lift and the ailerons and rudder to compensate for roll. In **1942 THE PACIFIC AIR WAR**, all of this is done for you by the automatic trim feature. Though this may seem unrealistic, the theory behind it is simply that trimming comes effortlessly to a pilot as skilled as you, like breathing. You don't think about it, you just do it.

### **ACCELERATION AND DECELERATION**

Acceleration and deceleration – speeding up and slowing down – are controlled by many factors, few of which are under your control. The throttle is the one factor over which you have the most control. More throttle means higher speed (and faster fuel use), and less means lower speed. Diving also adds to your airspeed. Climbing and turning both cause your plane to lose speed, as does flying with your gear down. You can also use the Dive Brakes if you want to cut your speed quickly.

## ***RISING AND FALLING***

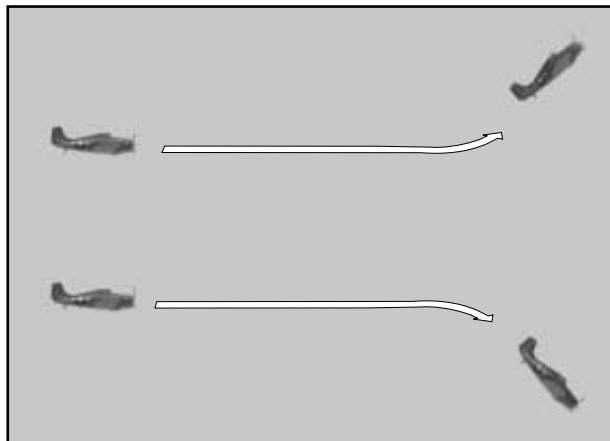
Rising and falling are two of the most often misunderstood and under-appreciated essentials of flying. If you want to gain altitude, the preferred method is not pulling back on the stick, as a rookie pilot might assume. That will cause you to rise, but it also pitches your nose up and slows your plane. Increasing throttle not only makes you gain altitude, it adds to your airspeed.

To lose altitude without gaining speed, cut back on the throttle. In this way, you avoid pushing the stick forward, which would lower your nose and add significantly to your airspeed. Pushing the stick is also a good way to cause a redout. If you must stick forward to fall, use your air brakes if you need to prevent the gain in airspeed.

Note that in **1942 THE PACIFIC AIR WAR**, these effects are almost entirely cancelled out by the automatic trim feature. The auto-trim works to keep the aircraft level and steady during normal flight. There are limits to what the auto-trim can compensate for, however. Rising and falling effects will be a factor at sufficiently high and low speeds.

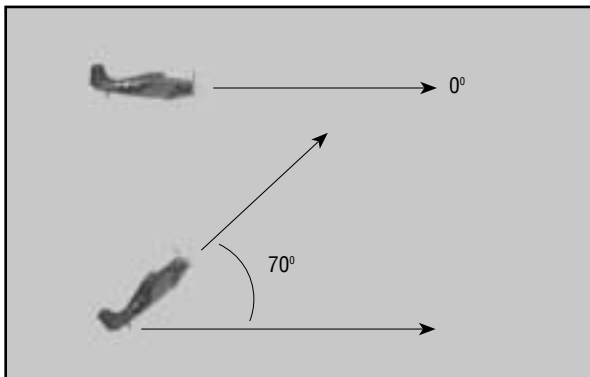
## ***CLIMBS AND DIVES***

Climbs and dives are more dramatic ways of gaining and losing altitude. To climb, pull back on the stick. The farther you pull, the steeper the climb will be. Keep in mind that the steepness of any climb is limited by your airspeed and the capabilities of the aircraft. To dive, push forward on the stick. The farther you push, the steeper the dive. Diving will cause your airspeed to creep up; use your air brakes to keep from gaining too much speed.



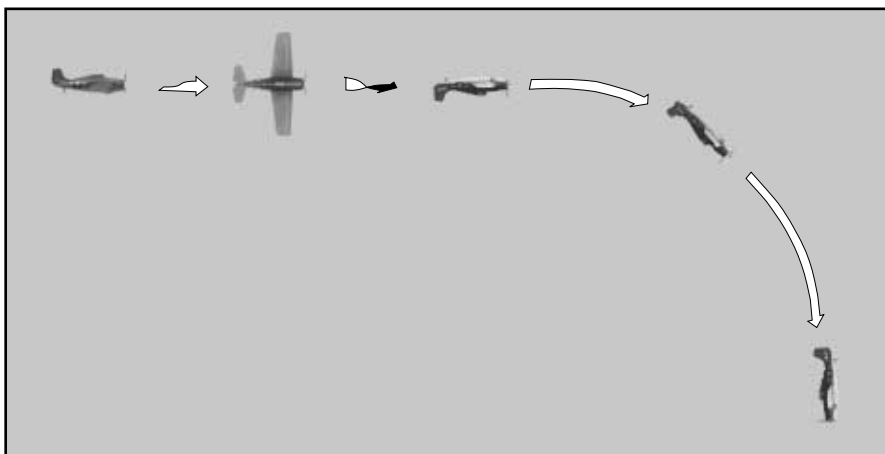
*Climb and Dive*

The reason this works is that tilting the plane changes the “angle of attack” of the wing surface. The angle at which air encounters the airfoil determines the amount of lift acting on the plane. A greater angle of attack means more lift, so your plane rises. A lesser angle of attack means less lift, causing your plane to fall.



*Angle of Attack*

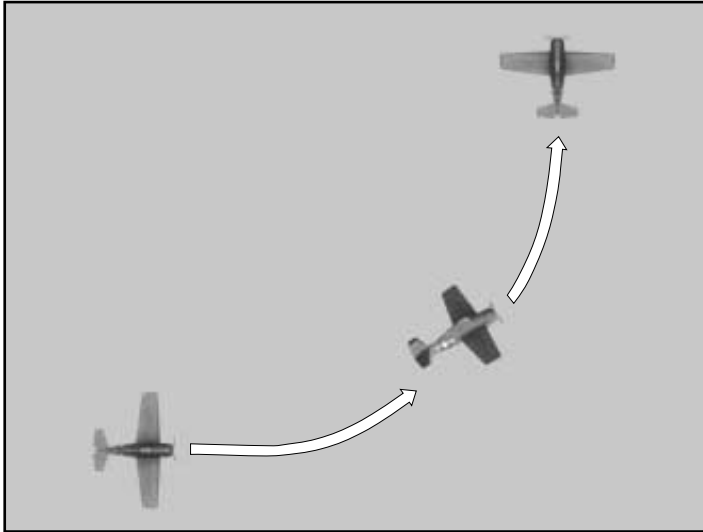
Remember also that quick, steep dives are the main cause of red-outs. Combat pilots who want to lose altitude quickly will not normally push the stick forward. Instead, they flip the plane over, then pull back on the stick to “climb” downward. Repeating the flip and climb straightens the plane out again, or you can continue the downward “climb” and end up pointing back the way you came (if you have room – otherwise, you end up getting your plane wet). Please refer to the **Split-S** maneuver in the **Advanced Flight** subsection for a detailed description and a diagram.



*Steep Dive*

## ***SIMPLE TURNS***

Simple turns are called “banks”. Push the stick to either side to tilt your plane to that side, thus turning in that direction. You can also push the rudder to that side to tighten the turn. You will notice that you lose speed as you turn, the nose starts to drift downward, and you begin to lose altitude. Add throttle to speed up, then pull back on the stick and ease the rudder in the opposite direction to counter this drop. For every aircraft there is an optimum airspeed for making nice, tight turns. If you are flying faster than this optimum, your turn will be more open than necessary; if you are below the optimum airspeed, you will lose altitude more quickly.



*Simple Bank*

## ***AUTOPILOT***

Autopilot is an option not everyone will want to use. Few of the aircraft you can pilot in **1942 THE PACIFIC AIR WAR** actually had an autopilot installed, and none had one as sophisticated as this. This feature is included strictly to ease gameplay in certain situations. For example, if you choose to accelerate time (please refer to the **Game Player's Guide** for instructions), the plane will become extremely hard for you to control; the autopilot has no such problems. The autopilot will take control of the plane and fly any portion of the mission for you, including combat. Your plane, in essence, becomes just another of the many computer-controlled aircraft. (Of course, if you have gotten your aircraft damaged beyond control, the autopilot can not help you. Bail out.) Turn the autopilot off again to regain control of your plane.

## FINAL ADVICE

You can learn more advanced maneuvers from watching your fellow pilots, especially your lead. Analyzing the tactics of the enemy is another good way to learn. (According to Sun Tzu, your enemy is the most important teacher of all.) During dogfights, though, you're usually quite busy, and there's rarely time for analyzing every move. Later, in the security of your base of operations, you can review flight films at your leisure. Please refer to the **Flight Films** section of the **Game Player's Guide** for detailed instructions on viewing and saving these valuable references.

## INSTRUMENTS

The instruments in the cockpit do not really vary from plane to plane. Every aircraft in the Pacific theater is outfitted with the same essential instruments, though they are certainly not in the same place in every cockpit. **1942 THE PACIFIC AIR WAR** reproduces the most important instruments, leaving out much of the complexity of the cockpit instrumentation to facilitate gameplay. This basic set of gauges and dials are summarized here.



*Sample Cockpit: Std View*

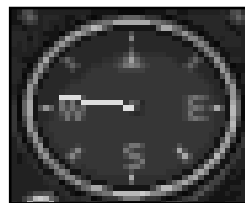
Remember that many (if not all) of the instruments in your cockpit will be located below the "dashboard" visible in the standard cockpit view. Tilt your view down and up or (in fighters) use the **Virtual Cockpit Mode** view to get a look at these gauges.



*Sample Cockpit: Lap View*

## COMPASS

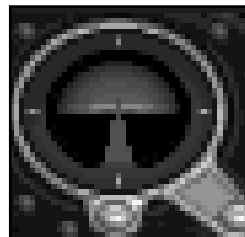
The compass is a simple, magnetic direction indicator. Whatever heading is at the top of the needle is the direction in which the nose of your aircraft is pointing. Headings are numbered from 000 (zero) to 360, starting and ending at due North and proceeding clockwise. Thus, due North is both heading 000 and 360, East is 090, South is 180, and West is 270.



*Magnetic Compass*

## ARTIFICIAL HORIZON

The artificial horizon (also called the “Attitude Indicator”) is a floating ball that indicates your plane’s relation to the surface of the Earth, or attitude. This is extremely useful when visibility is poor or for some other reason you cannot see the natural horizon. If you are flying level, the artificial horizon will be centered and flat. If you are banking or rolling, it will be at an angle. When you climb, the light part (the “sky”) will cover more of the gauge; when you dive, the dark part (the “ground”) covers more. Keep in mind that the artificial horizon represents the actual, natural one. This is not radar! Irregularities in the surface of the Earth (mountains and such) are not reflected on this gauge.



*Attitude Indicator*

## AIR SPEED INDICATOR

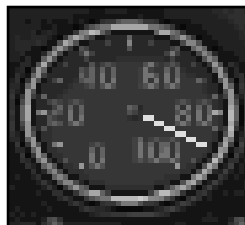
The air speed indicator is a dial that registers the speed of your aircraft in relation to the air around it. This airspeed is indicated in knots, which are nautical miles per hour. Remember that, since a nautical mile is longer than the statute mile used for land travel, your airspeed is a deceptively lower number than your speed with relation to the ground. Since the actual velocity is the same, mistaking knots for miles per hour can cause serious problems when landing. Also keep in mind that your airspeed must remain above a certain minimum (different for each model of aircraft) to stay aloft. Lower airspeed means greater control of the plane’s lateral (horizontal) movement, but less power for climbing.



*Airspeed Indicator*

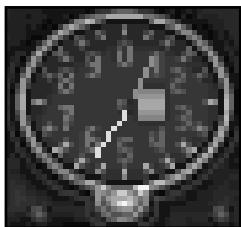
## TACHOMETER

The tachometer dial measures the rpm (rotations per minute) of the aircraft’s engine. Under most circumstances, this is also the rpm of the propeller crankshaft. (Many planes had step-up gears and such, so this is not always true.) This indicator of engine power is relative to, but not directly determined by, the amount the throttle is open. Though the tachometer can serve as a rough guide to how much throttle you have on, especially during level flight, do not rely on rpm for an exact gauge. Knowing your engine’s rpm is primarily useful when you are planning a maneuver that requires a certain amount of engine power. Climbing, for example, or pulling out of a particularly steep dive.



*RPMs*

## ALTIMETER



*Altimeter*

The altimeter tells you how far above sea level you are. The short needle indicates thousands of feet, the long needle indicates hundreds. So, for example, when the long is at “2” and the short is at “4”, you are 4200 feet above sea level. Since none of the aircraft in **1942 THE PACIFIC AIR WAR** is equipped with radar, radar altimeters are out of the question. Your altitude is measured as a function of the ambient air pressure, **not absolute altitude**. What this means to the pilot is that you can only trust your altimeter when flying over the ocean (which is pretty flat and always very close to sea level). Over land, you must stay alert for changes in the topography. If you are less than 100 feet above a 2000-foot mountain, your altimeter will still read 2100 feet. An inattentive pilot might feel safe making a dive and later (assuming he survives) wonder why he crashed.

## OIL PRESSURE GAUGE



*Oil Pressure*

The oil pressure gauge, like the one in an automobile, keeps track of the pumping pressure of the oil that lubricates your aircraft’s engine. Since your flight crew are the best the navy has to offer, you can assume that there is nothing wrong with the engine when you take off. If you start to lose oil pressure, there can be only one explanation – your engine has been damaged by enemy fire.

The leak may not be a bad one, but you shouldn’t take chances. If you can, return to your take-off point right away. If you do not, the oil will eventually all run out, and the plane’s engine will seize (stop working suddenly). If you’re lucky, you might be able to glide to a safe landing, but it’s much more likely that you’ll end up a sitting duck for enemy pilots to shoot down. If you choose to stay in the fight and end up bailing out, fine. Living to fight another day is better than going down with your plane. However, unless you had a damn good reason for staying, expect a reprimand. Bringing your country’s plane home with you is more important and honorable than seeking personal victories and fame.

## ENGINE TEMPERATURE GAUGE



*Engine Temp.*

The engine temperature gauge indicates the operating temperature of your aircraft’s engine. As you warm up prior to taking off, this gauge should rise from the bottom to hover approximately in the center of its range. Under normal conditions, engine temperature will not deviate substantially from this center. Note that combat flying at high RPMs is not considered normal conditions.

During combat maneuvers, running the engine without oil, carrying heavy loads, or when the engine has been damaged, the temperature may rise to dangerous levels. If the temperature nears the top of the indicator’s range, there is a good chance your engine will cease functioning. Avoid this if at all possible. Although you will hear stories of cooled-off engines that were restarted in flight after overheating, these are almost miraculous exceptions to the rule. Most pilots who overload their engines simply crash and die. Overheating causes permanent damage to the engine which must be repaired before the aircraft is airworthy.



## **FUEL GAUGE**

The fuel gauge, like the one in a car, tells you how much fuel is left in the tanks. The level in your main tank is measured by the bright white “Main” needle of the gauge, while the level of fuel in any external tanks (normally, these will only be mounted for search flights and some fighter missions) is indicated on the dimmer “Reserve” needle. If the reserve tank runs out, the engine will begin drawing from the main tank automatically. Once the external tank is empty, you should consider jettisoning it. Without the excess weight of the empty tank, your plane will handle better and fly faster.



*Fuel Gauge*

## **MANIFOLD PRESSURE GAUGE**

The gauge labeled “MP” is not the Military Police Indicator, it measures manifold pressure. This is an approximate measure of the air pressure inside the engine. Taken together with the Tachometer reading, this information gives you a very good idea of how much horsepower you have available. A lower manifold pressure means less available power, while a higher one (always assuming that the pressure is not great enough to destroy the engine) generally means you have more horses.

Note that the M.P. can also be a reliable indicator of engine damage. If your engine is punctured by one or more bullets or chunks of shrapnel (or a spear, for that matter), the manifold pressure will start to drop. If the pressure ever drops all the way to zero, one of two things is the case. Either you have turned the engine off or it has ceased functioning and become ballast.

Manifold pressure has a habit of becoming slightly lower as your altitude increases, reflecting the decrease in ambient air pressure. Thus, at higher altitudes (usually above a certain optimum operating altitude, which is different for each model of aircraft) you will tend to get a little less power from the same amount of throttle.



*Manifold Pressure Gauge*

## **RATE OF CLIMB INDICATOR**

The R.O.C. Indicator lets you know how quickly your altitude is changing. Though you can get a rough approximation of this by watching the altimeter move, sometimes you need to know in a glance, and that's where the R.O.C. comes in. If the needle is above the centerline, you're climbing; if it's below, you're diving (or falling). Different planes have different scales (x10, x100, x1000, etc.), but the hash marks on the dial will always indicate a number of feet per minute.



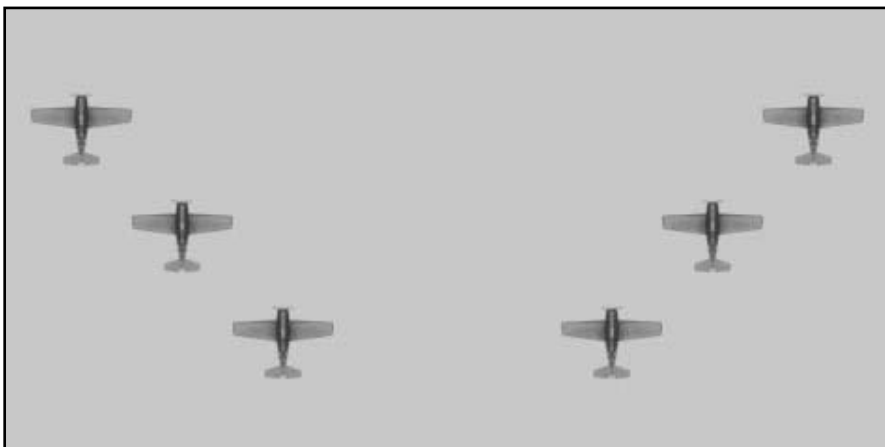
*R.O.C.*

## FORMATIONS

If you've gone ahead against advice and flown a mission or two without reading this, you probably noticed that the aircraft in your flight are flying in formation. (Excepting you, of course, since you had no idea what was going on.) This is standard procedure, even if your flight is only yourself and one wingman. Your flight should stay in formation until the enemy engages you in combat or the mission ends. All of the normal formations you will encounter in **1942 THE PACIFIC AIR WAR** are variations on two basic themes.

### ***ECHELON***

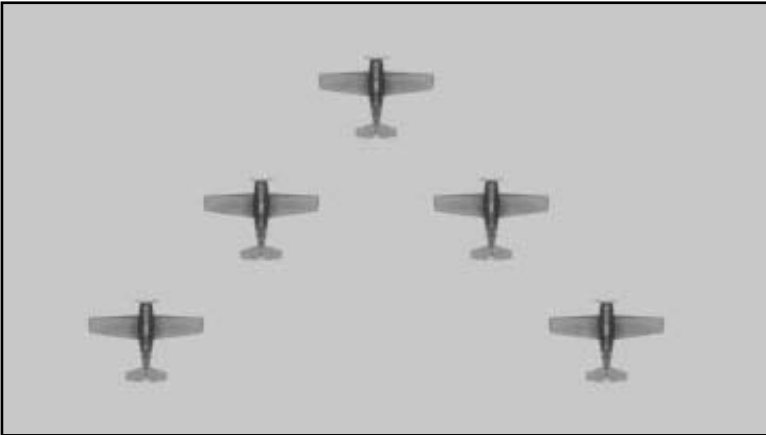
Echelon formations come in two flavors: echelon left and echelon right. The planes fly behind and to one side of each other, forming a diagonal or "stair-step" line. This type of formation can accommodate any number of aircraft, though it is not suggested for more than five. A two-plane echelon is the standard lead and wingman formation.



*Echelons*

## V

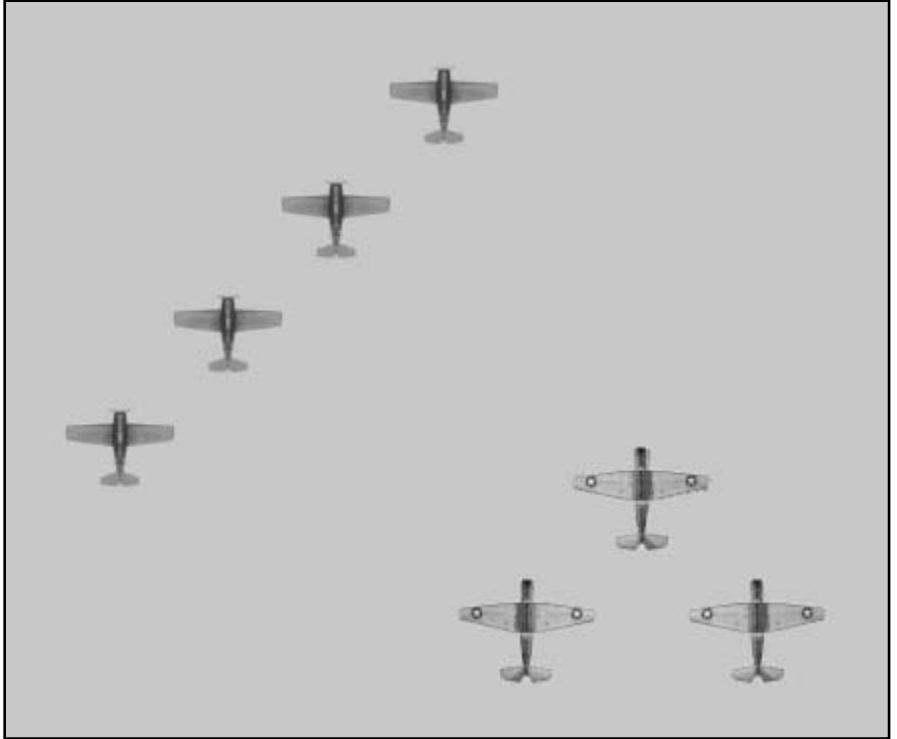
V Formations, or “Vees”, are the standard formation for flights of bombers (and geese). The front two following planes keep position behind and to each side of the lead aircraft, thus forming the ‘V’. Any further planes extend the legs of the formation; the standard V does not include any aircraft within the legs of the V. When there is an even number of aircraft in a V formation, the flight leader decides which leg will be extended. The two-plane V is essentially the same formation as the two-plane echelon.



*V Formation*

## ***BOMBER ESCORTS***

Bombers and their escorts fly near each other, but not in the same formation. As noted above, flights of bombers generally travel in a V formation. The escorting flight of fighters should keep 1000 feet above the bomber group and 1000 feet out in the direction from which the enemy is expected. Any formation is acceptable for the fighters, so long as it maximizes the protection of the bombers.



*Bomber Escort*

There are several easy maneuvers that are not only basic, but essential to combat flying. You may already be familiar with some of them. Regardless, you should practice every time you begin flying a new type of aircraft; every plane reacts differently, and you should always adapt to your aircraft – it will not adapt to you.

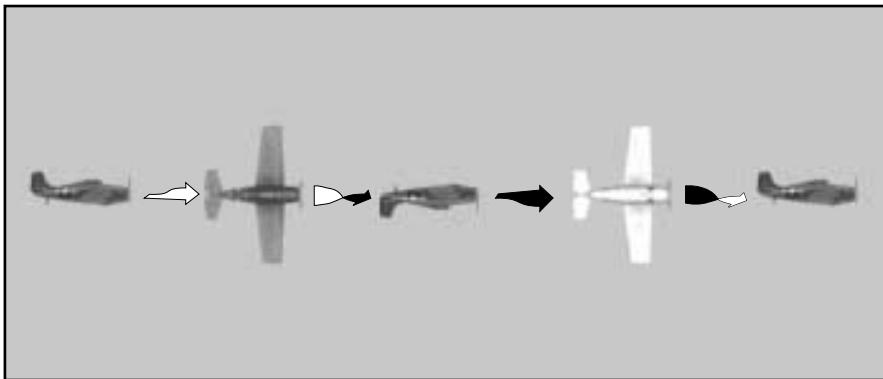
### ***Aileron Roll***

The aileron roll is not a maneuver that you are ever likely to use, unless you fly in an air show after the war. The utility of this simple roll is that it is a basic component of almost every other possible maneuver, trick, or trap you might use.

Push the stick all the way to either side, hold it there, and you will perform an aileron roll. Center the stick again once you return to an upright attitude. Now roll in the opposite direction. Notice how your plane acts during the rolls: which direction it “likes” to go in, how much speed and altitude you lose, etcetera. The little things get to be very big during a close-in dogfight.

Now roll into the inverted position and center the stick there. Spend a little time upside down and see what the plane tries to do. Roll back over whenever you’re ready (preferably before you hit the water). The half roll is the first step in many an important and useful maneuver.

## **SIMPLE MANEUVERS**

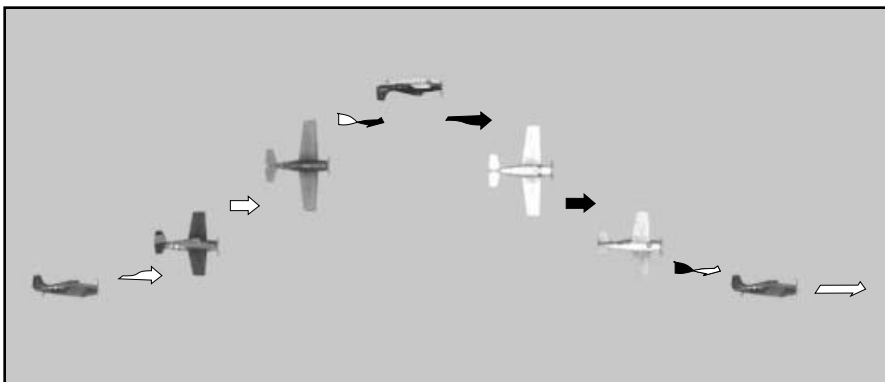


*Aileron Roll*

## ***BARREL ROLL***

A barrel roll can occasionally be useful in a dogfight, especially if your opponent is inexperienced or just plain stupid. It is similar to the aileron roll, but has a lateral component that turns it from a spin-in-place to more of a horizontal corkscrew motion. Unless your enemy is on your tail, performing the full roll may not be of any value. The barrel roll is similar to the aileron roll, however, in that a partial roll is often used as a part of another, more complex, maneuver.

To perform this roll, you push the stick to one side as in the aileron roll, but you also pull it back a bit. A perfect barrel roll brings you back to the same position and altitude, but lowers your airspeed. (Normal pilots will lose some altitude.) It is the lessening in your speed that will sometimes trick your opponent into overshooting. When you recover your position, you will likely be right in his six.



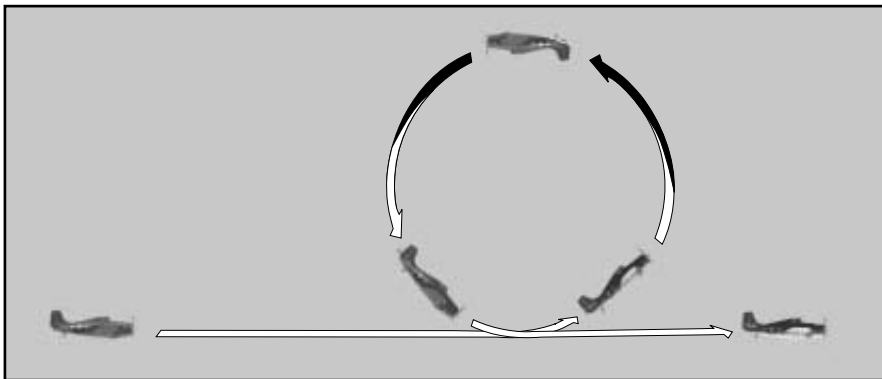
*Barrel Roll*

## ***LOOP OVER***

The loop over is what most people (including roller coaster designers) simply call a loop. A related maneuver, the loop under, is also covered here; thus the slight difference in the name. The loop is, essentially, a way to turn your plane over and end up back where you started. Sometimes it is useful in combat, but its primary importance (as with most basic maneuvers) is as a part of more complex maneuvers.

Make sure you have plenty of airspeed before you try a loop over. If you run out of steam partway through, you will stall and could end up in a spin (which is bad). Pull the stick all the way back and hold it there. If you do start to stall, give it more throttle. During the first half of a loop over, you will lose airspeed dramatically. This makes you an easy target for anyone who foresaw the maneuver. If you do notice someone shooting at you, however, you can easily roll out of the loop and enter a dive, using up some altitude to gain speed. Unfortunately, an enemy who saw the loop coming will probably be ready for the dive, too.

After you reach the top of the loop, you won't need the extra throttle any longer; you'll reclaim almost all of your lost airspeed from gravity during the second half. At the end of the loop, you should return to the same heading and speed you started with. Center (neutralize) the stick for level flight.



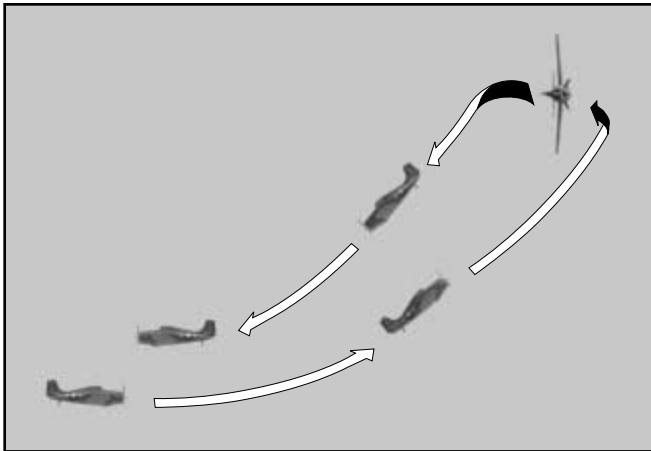
*Loop Over*

## **WING OVER**

The “wing over” is what was originally called an “Immelmann”; however, there is another Immelmann maneuver now, so this turn has been renamed. A wing over is a handy way of turning around at the end of a strafing run, but is not much use in a dogfight. Since you begin the turn by climbing, thus losing speed, you’d be a sitting duck for any alert opponent. Note that you cannot perform this maneuver unless you use rudder pedals or some other (non-automatic) method of controlling the rudder.

As mentioned, you start a wing over by pulling back on the stick and climbing. The idea here is to gain a little altitude and lose some airspeed. Therefore, do not increase throttle to compensate for the plane slowing down. One of the consequences of the aerodynamics of flight is that rudders are most effective at low speeds.

When you have sufficient altitude to begin another run and your airspeed is in the good range for rudder control, it’s time to turn. Kick the rudder full to either side and neutralize the stick. Your aircraft should do a quick 180-degree turn, exactly like a car doing a J-turn. Push the stick forward and go into your strafing run.



*Wing Over*

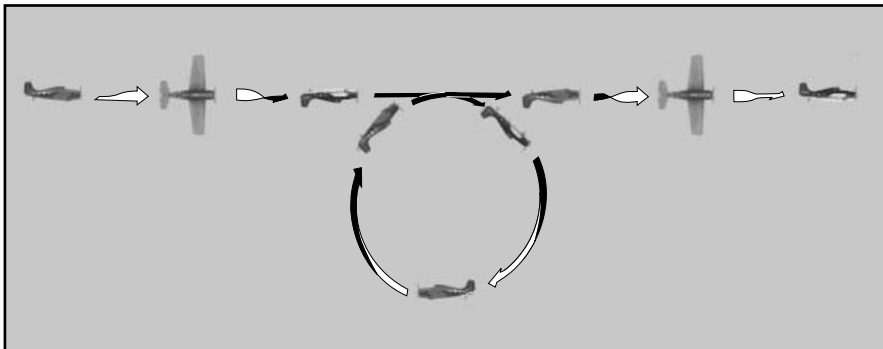


## ***LOOP UNDER***

The loop under is essentially a reversed loop over, except that it can be more dangerous. It is also more valuable in combat, since you gain speed quickly early in the loop. The loop under is also used as one step in some more complicated maneuvers.

You don't need to worry about airspeed when you start, but you do have to consider your altitude. If you have less than 5000 feet beneath you, don't bother (unless you want a swimming lesson). Perform half an aileron roll, so that you're inverted. Pull back on the stick and hold it there. During the first half of a loop under, you will gain airspeed quickly. This can be pretty handy when trying to elude an opponent. Do not do anything to slow yourself down, or you may not be able to complete the loop.

After you reach the bottom of the loop, you'll stop accelerating and begin to lose airspeed on the way back up. This is when you become vulnerable to any enemy who sees what you're doing. If it becomes necessary, you can increase throttle to finish faster or simply roll out of the loop. At the end of an uninterrupted loop, you should return to the same heading and speed you started with. Neutralize the stick to return to level flight.



*Loop Under*

## **EMERGENCY PROCEDURES**

It would be nice to think you'll never need to know any of the emergency procedures outlined in this section, but let's be realistic. You're not flying a kiddie ride at Coney Island – this is a war. Since this information could (and probably will) save your life and our expensive aircraft, you will learn it. Trust me, it's for your own good.

### ***RECOVERING FROM A STALL***

A stall isn't really an emergency – unless you don't know how to deal with it. A wrong move during a stall could easily put you into a spin, and if you can't cope with a stall, you sure as hell won't be able to save yourself from a spin.

Your aircraft will stall when it does not have enough lift to balance out the force of gravity. There are lots of ways this can happen, but two are most common. The first is a simple lack of thrust. Since thrust is what keeps the air flowing around the wing, and the airflow generates lift, lack of thrust equals lack of lift. The second is more complex. Whenever your aircraft is climbing, the angle of attack is increased; if you do not have enough forward motion (thrust) to compensate for the loss of lift this causes, the plane could stall. This is the more dangerous type of stall, partly because of its complexity and partly because you were probably climbing for a reason.

If you go into the second type of stall too low, you'd better bail out. Without enough sky under you to safely recover and get out of the resulting dive, you haven't got a chance.

To recover control from the first type of stall, you don't really have to do anything. The nose of the plane will dip when you stall, and you will start to gain speed as you dive. The extra speed should cancel the stall, and you'll regain control of the aircraft. Alternately, you could increase throttle. This is probably the better option, since otherwise you'll just stall again.

The second type of stall is more troublesome. Since you were climbing, your nose is pointed up. The first tendency of the aircraft, then, is to go nose-down and act like a rock. Let it. Neutralize the stick, and you can control the direction in which the nose falls using the rudder. If you're not at too great an angle, you may even be able to get the nose to fall forward, into a standard dive.

Once you're diving, neutralize the rudder and use the stick to straighten out. Pull out of the dive as gently as your altitude and situation allow. Next time, be sure you have enough airspeed for the climb, or use more throttle to avoid stalling.

### ***GETTING OUT OF A SPIN***

Spins are potentially the most dangerous situation a pilot can get into. The pilot's handbook for almost every aircraft warns against entering a spin intentionally, since they can be so difficult to escape. Unlike some other ways of "sitting down on the water", a spin will almost never conclude with a survivable belly landing. To survive a spin, you must either get out of the spin or get out of the plane.

If you go into a spin at any altitude below 3000 feet, bail out immediately. You do not have enough maneuvering room to save your plane, so you may as well save your life.

If you feel you have enough room below you, your first action should be to jam the rudder hard (“with a positive motion,” the book says) in the direction opposite the spin. Hold it there. Half a spin later, push the stick full forward, jamming the elevators to full. Do not move the stick to the side under any circumstances; keep it centered. Neutral ailerons are essential to stopping the spin. Do not adjust the throttle at all.

If there is no change in the spin after five turns or so, try something else. Often, if you were going exceptionally fast when you entered the spin, you should allow more time for the recovery. Unless you feel you are getting control, you should bail out when you get too low.

If and when the spin eases and you feel control of the plane returning to you, you will find yourself in a dive. Ease out of it as gently as your altitude and situation allow, so as to avoid going into another spin.

## **DAMAGE**

There is absolutely nothing you can do to repair damage to your aircraft while in flight. The instruments in the cockpit will be your warning when your plane takes damage. Sluggish controls or loss of control of the plane are also reliable signs of damage. Your only recourse is knowing how to cope and how to react.

Remember, once you’re airborne you are in command. If the damage to your aircraft is severe enough that you are having trouble controlling your flight, you have a command decision to make. Use your best judgment as to whether to continue on and attempt to complete your mission. Too much damage will make your mission impossible, and you may need to return prematurely. If the damage is too great, you may even have to bail out in order to save your life (and the lives of your crew). Although there is no loss of face in a necessary retreat, keep in mind that you will be held responsible if you overestimate the damage or react out of cowardice.



*This B-17 made it home because the pilot knew what he was doing.*

## ***FIRE***

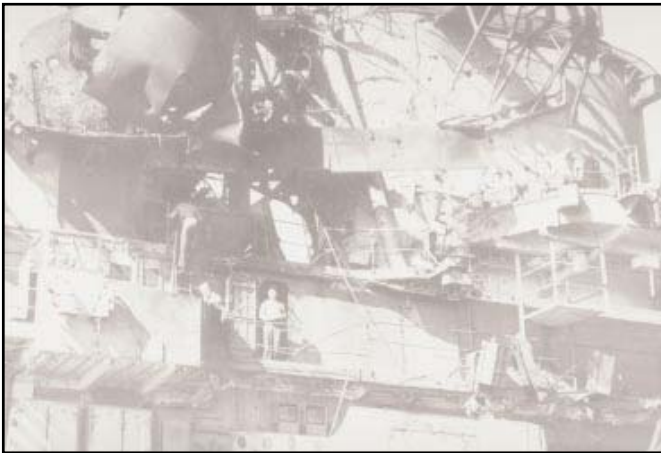
If your aircraft is burning, what you do depends on where you are. Generally, the first warning sign of a fire will be the enormous, black billows of smoke coming out of the rear of your aircraft. This means that the aircraft's fire control system has not been sufficient to extinguish the fire. You have only three viable options, and none of them is particularly pleasant.



*This is flak; It is very dangerous*

You should ditch the plane if you feel there is any chance of you and maybe it being recovered and repaired by friendly forces. This is the correct action if you are near your home base or a friendly ship, but not if you are in the thick of battle over an enemy task force. Do not attempt to land a burning aircraft on a friendly runway. You will be held responsible for any and all damage caused by your foolishness. Note that safely ditching a burning plane is extraordinarily difficult; most pilots will not attempt such a maneuver unless they are suicidal.

If you do not wish to ditch the plane, but you are not in proximity to enemy forces, your best bet is simply to abandon the cockpit. Get your plane as close to level flight as you can manage, then bail out. Remember, you probably don't have too much time before the fire reaches the fuel tanks, so don't dilly-dally. With luck, you will be rescued before starvation, the sharks, the enemy, or a monsoon kills you.



*Damage to the USS Ticonderoga, caused by well-aimed Japanese aircraft*

The last and, admittedly, the most dangerous option is to use your flaming aircraft as an offensive projectile. If you find yourself aflame in the midst of enemy forces, your chances of survival are pretty slim, anyway. Put yourself into an uncontrolled nose dive, aimed directly at the nearest enemy vessel. When you feel that your aim is true and your aircraft cannot possibly miss the target, you have the option of bailing out. That is entirely up to you. If you do manage to bail out and survive, there is a tiny hope that you will be retrieved by friendly forces. If you are taken prisoner, do not worry. We're pretty sure all the propaganda about captured pilots being tortured to death is untrue.

## **BAILING OUT**

Bailing out is a simple, last-ditch attempt to save your life after you've fouled up in combat. (This is giving you the benefit of the doubt by assuming that your plane was damaged in combat with the enemy, not by your carelessness.) What you do is abandon the aircraft and parachute to the surface.

If you land in the sea, your life raft will inflate automatically, and you will survive for quite some time on the rations and water included with the raft. If you land on an island, your best hope is that you might be spotted and rescued by a friendly ship passing nearby. Remember that any island may be occupied by friendly forces, the enemy, or vicious headhunting natives.

One last bit of advice. Headquarters wants to assure you that helpless, parachuting pilots are not considered viable targets. None of the reports of the enemy shooting down defenseless pilots and their parachutes has been confirmed. You know how these rumors spread.

If you understand everything in the **Simple Maneuvers** section, then you're well on your way to becoming a useful pilot. Useful to the Navy, that is. At this point, you could probably survive for a few seconds against an experienced opponent.

Now, you're going to learn a few things that will help you turn that survival time into a chance to perforate the enemy's plane. After all, that's really the whole idea here, isn't it? Note that the potential uses of the techniques described here are only suggestions; any maneuver is as versatile as the pilot who undertakes to learn it.

## **ADVANCED FLIGHT**

### **APPROACH**

As soon as you identify an aircraft as belonging to the enemy, the conflict has begun. Even though neither of you can effectively fire on the other yet, one of the keys to aerial combat is the balance of advantage and disadvantage in approach positions.

The first and most important consideration is **Awareness**. Clearly, you are aware of the existence, the position, and the approximate speed of the other plane. Depending on the angle at which you are approaching, he may not know you are there. (The converse is also true; if you suddenly see tracers cross your line of flight from behind, someone has gained a serious awareness advantage over you.) You can usually tell by the other pilot's action – or inaction – whether or not he has spotted you.

The next thing to consider is **Altitude**. Whichever aircraft is flying at a greater altitude has a distinct tactical and energy advantage. However, approaching most bombers from above is a mistake, as their tail guns are designed to protect from exactly that type of threat.

**Speed** is another vital consideration. The faster plane, like the higher one, has an energy advantage. More speed means more climbing ability and outrunning potential. Remember, though, that the slower plane is better able to maneuver (to a point) when it comes to rudder effects and tight turns. The faster aircraft may also be lured into overshooting, thus becoming a rather easy target.

The **Deflection** at which the attacking aircraft approaches is also critical. A pilot gets his best shot (most likely to do damage) when he fires along the flight path of the other plane. Otherwise, the uncertainty factor of leading the enemy comes into the picture. Deflection is measured by the angle the attacker's path makes with the path of the target. The greater the deflection, the less likely the shot will hit.

All told, the more advantages you have (or can create for yourself) before you start the fight, the more likely you are to be the victor. Putting those advantages to good use, however, is a matter of pilot skill and experience.

### ***DOGFIGHT VS HIT AND RUN***

The differences between the two basic types of aerial fighting are analogous to the contrasts between boxing and wrestling. A pilot with an advantaged approach often has the power to decide what kind of fight it's going to be, but a fast, maneuverable aircraft with an experienced pilot can force the fight to go the other way.

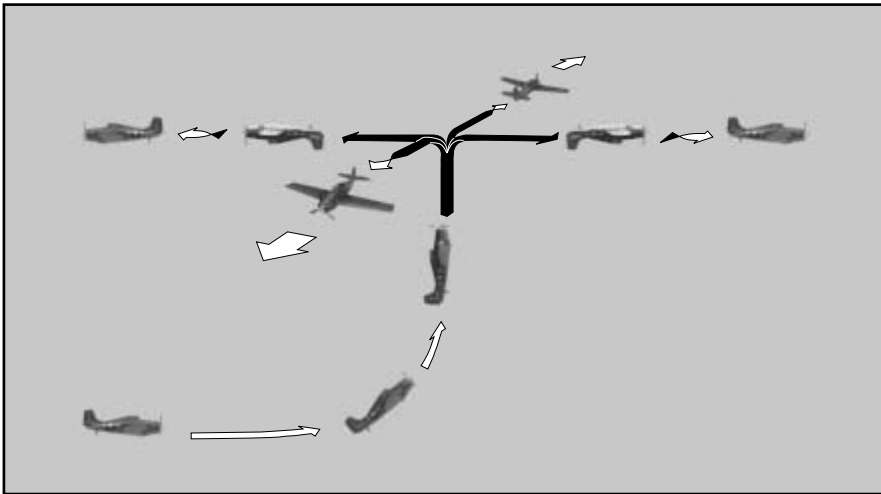
When most people say 'dogfight', they mean any midair conflict between aircraft. For simplicity, that's a good definition, but a pilot has to know better. A dogfight develops when two or more planes close with one another, getting into a close-quarters duel of maneuverability (usually a one- or two-circle fight). Obviously, if your aircraft is significantly less maneuverable than your opponent's, you will want to avoid this kind of close-contact fighting.

The other option here is an open conflict, which is sometimes called a 'hit-and-run' fight. In this type of aerial combat, the aircraft involved make repeated strafing passes ("slashing" attacks) at each other, depending on firepower, strategy, and endurance to win the day. This sort of battle emphasizes the advantages of altitude, speed, and situational awareness (knowing what's going on around you). Of course, if you know your plane isn't as tough or as hard-hitting as your enemy's, you should avoid hit and run and try to engage him in a dogfight.

## **IMMELMANN**

The modern Immelmann is a time-honored method of gaining altitude and (potentially) changing direction. It is a combat maneuver, but not one that you want to use when an enemy is on your six. At the beginning of the Immelmann, you lose speed and become vulnerable to attack. For this reason, you should only use this particular tactic when there's no immediate threat. The modern Immelmann is best used after a nose-to-nose pass, to turn for the next pass and gain altitude for an advantaged position.

It is important that you have enough airspeed; the Immelmann is a lot like a Loop Over. To start, pull back on the stick as if you are performing a loop. When you are exactly vertical (pointed straight up), you are at the decision point of the maneuver. This is where split-second thinking and reactions come in handy. If you're on the ball, you can roll your aircraft without losing your sense of position. Whatever direction the top of your head is pointing in when you leave the decision point is the direction your plane will take when you finish the maneuver.

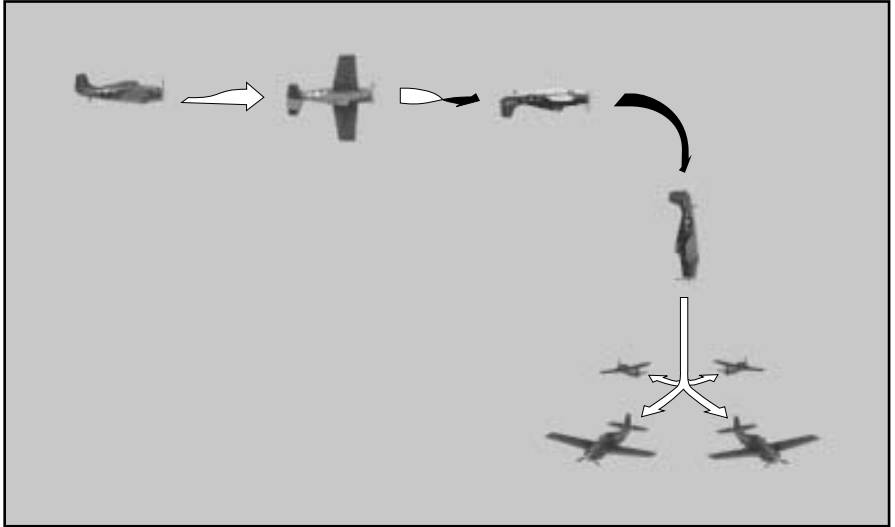


*Modern Immelmann*

After the roll, which should take place almost instantly, continue the loop until you reach the top. At this point, neutralize (center) the stick. Note that you are, in fact, moving in the direction that you chose at the decision point, though you are inverted. Roll the aircraft over. You have gained altitude and changed direction, though now your speed is significantly lower. If your opponent remained at the original level, you now have an altitude advantage and he doesn't yet know what direction you're going in.

## ***SPLIT-S***

The Split-S is really a vertically-reversed Immelmann, but nobody calls it that. It's a great way to drop a lot of altitude, gain speed, and change direction. This maneuver is often useful for escaping an opponent who is just about to shoot you down. Not only is it nearly impossible for your opponent to guess what direction you're turning to – making it difficult for him to follow you – but your new airspeed should give you more than enough juice to run away and end the dogfight.



*Split-S*

In this case, airspeed is not important; you'll be getting plenty right from the start. To begin, invert the aircraft and pull back on the stick as if you are performing a Loop Under. When you are exactly vertical (pointed straight down), you are at the decision point of the maneuver. This is where split-second thinking and reactions come in handy. If you're on the ball, you can roll your aircraft without losing your sense of position. Whatever direction the top of your head is pointing in when you leave the decision point is the direction your plane will take when you finish the maneuver.

After the roll, which you'd better finish quickly, continue the loop until you reach the bottom. At this point, neutralize (center) the stick. Note that you are, in fact, moving in the direction that you chose at the decision point. You have lost altitude, changed direction, and significantly raised your airspeed. If your opponent remained at the original level, he now has an altitude advantage, but he doesn't yet know what direction you're going in.

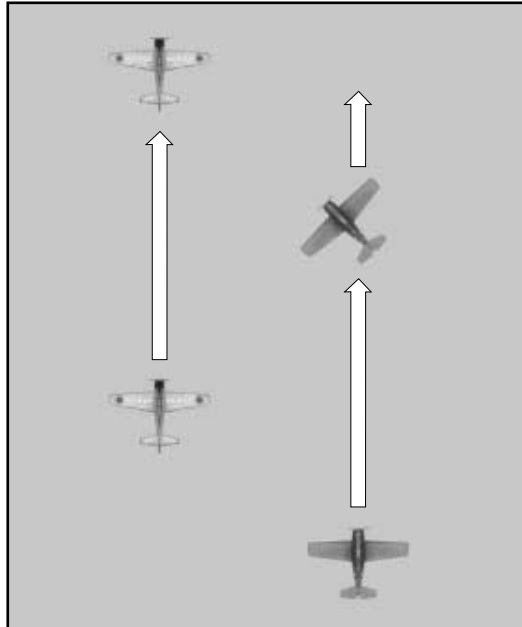
## ***INTENTIONAL STALL***

Despite what you may have read, heard, or seen, there is absolutely no reason to stall the aircraft intentionally unless you are performing in an airshow. In combat, this will get you killed – period.



## ***SKID***

Skidding is a rudder maneuver you can use offensively, but it takes some practice. Sometimes, you're behind an opponent (at about the same altitude), but not at the right angle to take a shot at him. He knows it, and he's flying straight, counting on it. You're both moving at below top speed. If you bank toward him, you'll get a short shot, but then you'll be past and he'll be on your tail. What you need to do is swing the nose of the plane around without changing the direction of your motion. Can do!

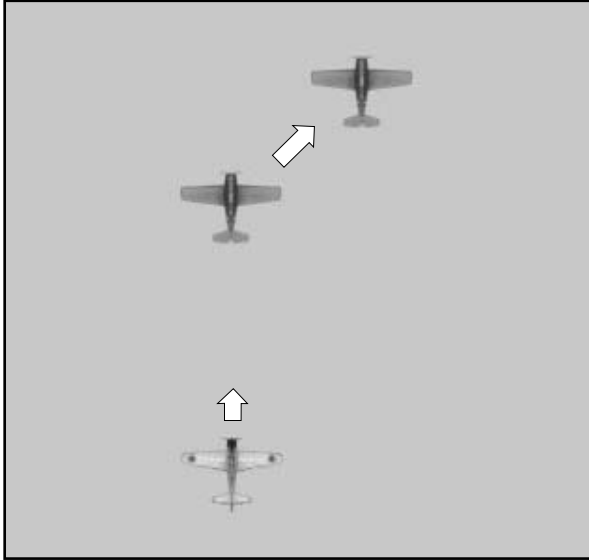


*Skidding the Shot In*

Jam the rudder in the direction of your enemy (that is, rudder left if he's on your left, rudder right if he's to your right). If your speed is right (in the range for good ruder control), the nose will drag itself over until you have a clear shot. Bam! What a surprise he's going to get!

## ***SLIP***

Slipping is another simple rudder maneuver, though you need to use the ailerons in this one, too. Its primary use is for momentarily dodging out of the line of fire of an opponent who has gotten the drop on you. You could probably also use it in place of a skid, to slide in behind the enemy plane.

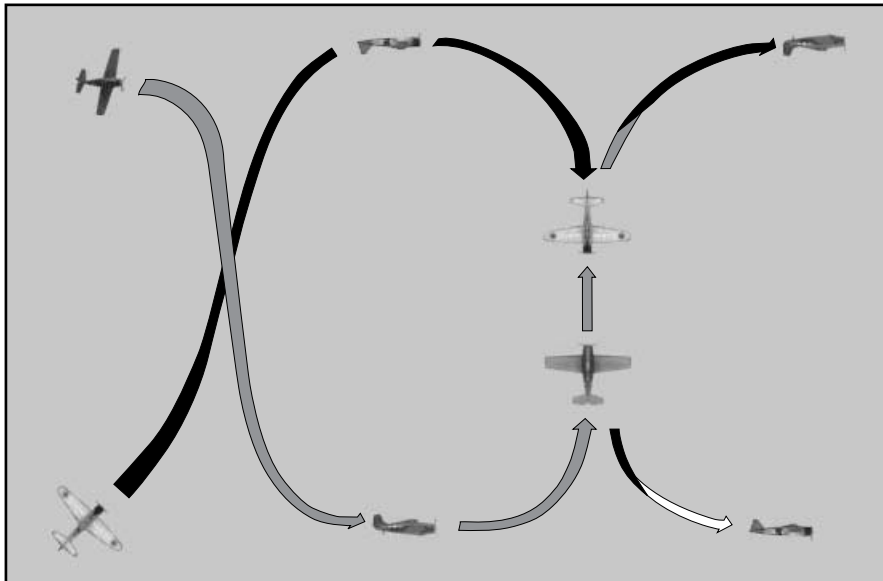


*Slipping Out*

Rudder hard in either direction, while at the same time banking in the opposite direction. This is a lot like compensating for a normal bank, but you want to use more rudder. The key here is that the two forces cancel each other as concerns roll; the plane should remain level. Level or not, your aircraft will “slide” to the side you banked toward. This is as close as you’ll get to flying sideways. Once your enemy catches on, he’ll slip, too, to catch you. You can repeatedly slip back and forth, thereby eluding him for quite some time. (Maybe help will come, maybe he’ll make a mistake and you can escape.)

## **SCISSORS**

The Scissors is a basic dogfighting technique. Two planes travelling in roughly the same direction cannot easily line up for head-to-head passes. Rather, they engage in a criss-crossing pattern of banked turns, each trying to out-turn the other and shoot first. Since lower airspeeds lead to tighter turns, the scissors is sometimes called the “race to go slow”.



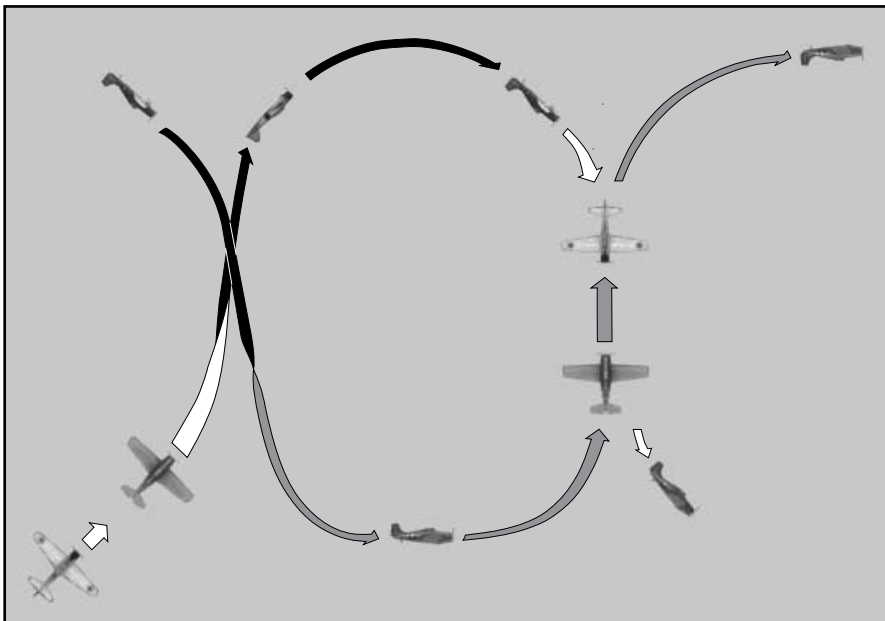
*Scissors Fight*

The scissors is really just a series of banked turns, as tight as they can get. Whenever the opponents can get a clear shot on each other, they blast away for all they're worth. Firepower counts in this sort of fight, but maneuverability is more vital. A Zero will almost always defeat a Wildcat or even a Hellcat in a standard scissors.

## THACH WEAVE

The Thach weave (no, it's not misspelled – it's named after Lt. Cmdr. John F. "Jimmy" Thach, in command of squadron VF-3 out of San Diego in 1941) is an American tactic developed by fighter pilots for defeating the Zero. If an American fighter got trapped in a one-on-one dogfight with a Zero, the Japanese aircraft had a big advantage. Sticking to hit and run tactics helped, but with the Zeke's extraordinary climb and maneuverability, the IJN pilot could usually draw the hapless American into a close-quarters fight.

During one particular air battle (so the legend goes), Thach had an inspiration. When a Zero got behind another American fighter, Thach radioed to the doomed pilot to fly as though he was in a scissors fight with Thach. When they came around head-to-head, the unwary Japanese pilot followed and ran right into the concentrated fire of Thach's wing guns. No Zero in the sky could hold up to this sort of fire for long, and there was no escape. Either the Japanese pilot continued to follow his target, hoping to survive long enough to get one kill, or he broke off to run, exposing himself to fire from both his opponents.



*Thach Weave*

The key to the Thach Weave is teamwork. Once an enemy gets behind one of your compatriots, you've got to start the weave pretty quickly. The fighter pilot who's acting as "bait" has to know his stuff, too. He needs to survive long enough (with the enemy right on his tail) for the "hook" pilot to get in and do his job. Executed correctly, the Thach Weave is a deadly trap with no real hope of escape.

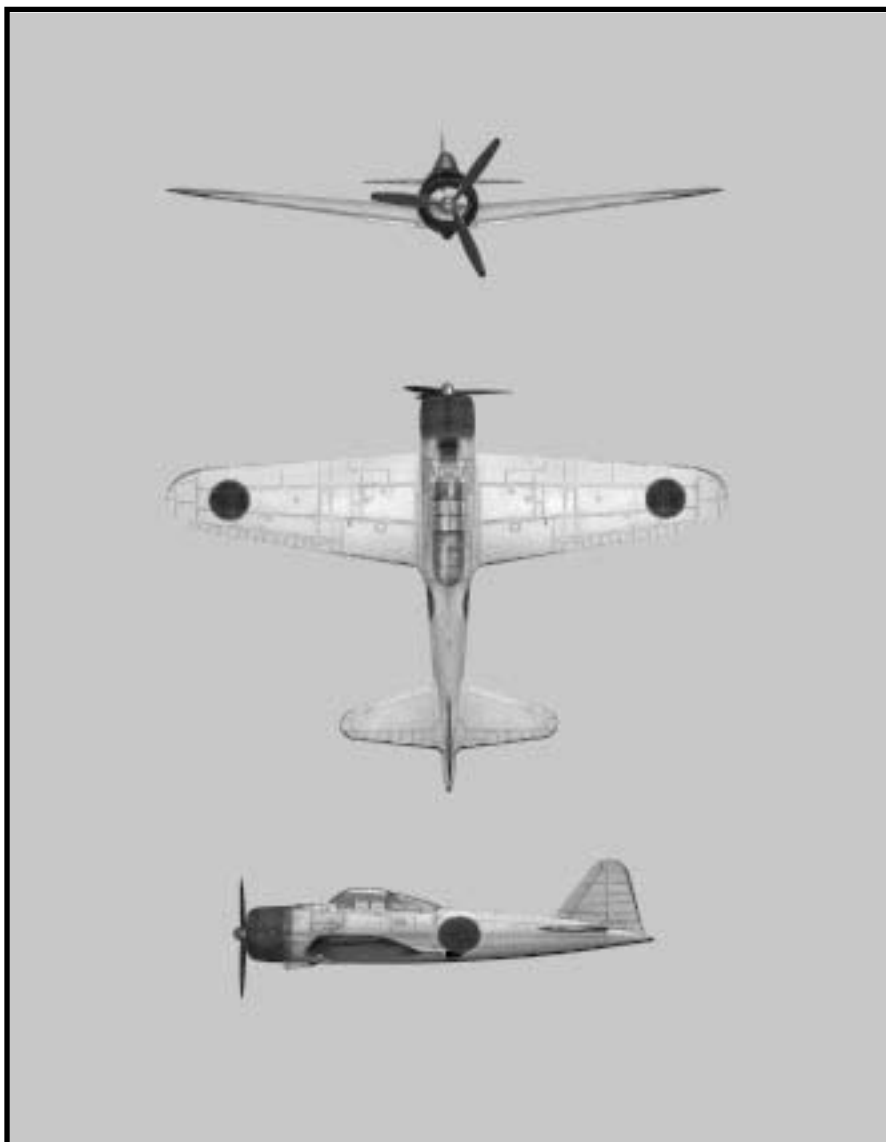


## THE COCKPITS

The following pages contain identification diagrams and important information concerning the enemy's aircraft and all of the planes you might end up piloting. The American Armed Forces' official designation names have been included for ease of reference.

Those familiar with combat flying will want to review the vital statistics of the aircraft they could be running into (or piloting). They know that there's a reason these numbers are called 'vital' statistics. You won't flunk out of flight school for not knowing the Reisen Zeros' hidden weak points, but you might flunk out of combat – permanently.

Some of our experienced combat and test pilots have written down a few of their thoughts on each plane. Where these were printable, they are included at the end of the statistics list.



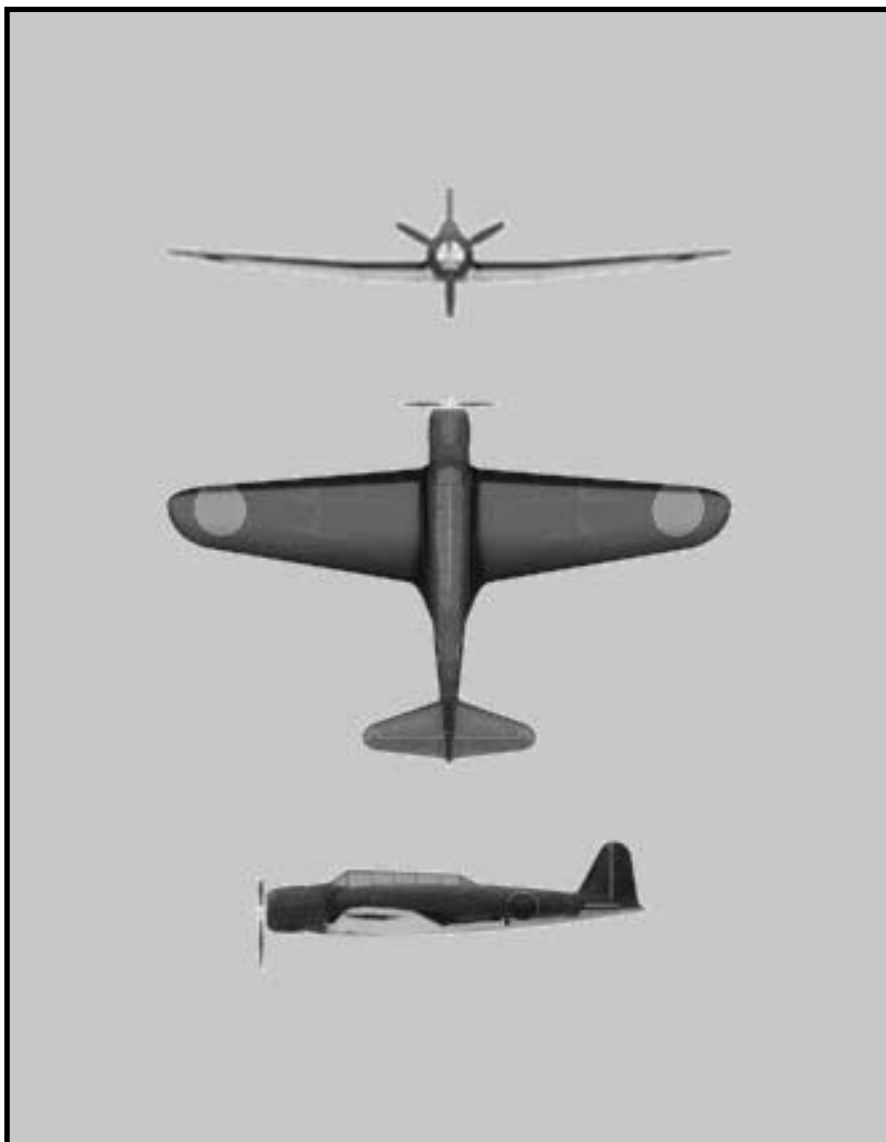
## ***“ZEKE” - THE MITSUBISHI A6M2 AND A6M5 REISEN***

Class:	Type 0 Carrier-borne Fighter Model 52
Stations:	Pilot
Weapons:	[Fixed] 2 Cowl-mounted 7.7 mm Machine Guns 2 Wing-mounted 20 mm Cannon
Ammunition:	[Payload] 2-132 lb. Bombs
	[MGs] 600 rd/gun
	[Cannon] 100 rd/gun
Firing Rate:	[MGs] 950-1000 rd/min (approx. 37 seconds of fire)
	[Cannon] 465-480 rd/min (approx. 13 seconds of fire)
Span:	39' 5" (M2) – 36' 1" (M5)
Length:	29' 9" (M2) – 29' 11" (M5)
Wing Area:	22.44 sq. meters (M2) – 21.3 sq. meters (M5)
Engine:	Nakajima Sakae NK1F (21) (Radial)
Max HPwr:	950 (M2) – 1130 (M5)
Ceiling:	32,810 ft (M2) – 38,520 ft (M5)
Cruise Speed:	180 kts (M2) – 200 kts (M5)
Max. Spd:	288 kts (M2) – 305 kts (M5)
Stall Spd:	71 kts (M2) – 73 kts (M5) [Level Flight]
Std Fuel:	156 gal
Max Fuel:	250 gal

Pilots' Notes: The fuel tanks on the Reisen (“Zeke” or “Zero”) are completely unprotected and are not self-sealing. As fighters go, these are sleek, fragile machines. The lack of armor is counterbalanced, however, by the Reisen’s excellent maneuverability and climb rate.

Stalls are gentle in the Reisen. A good landing speed is about 65 knots (make sure to use your flaps, otherwise you’ll stall). If you come up against a Corsair, try to close with him, don’t let him have the initiative.

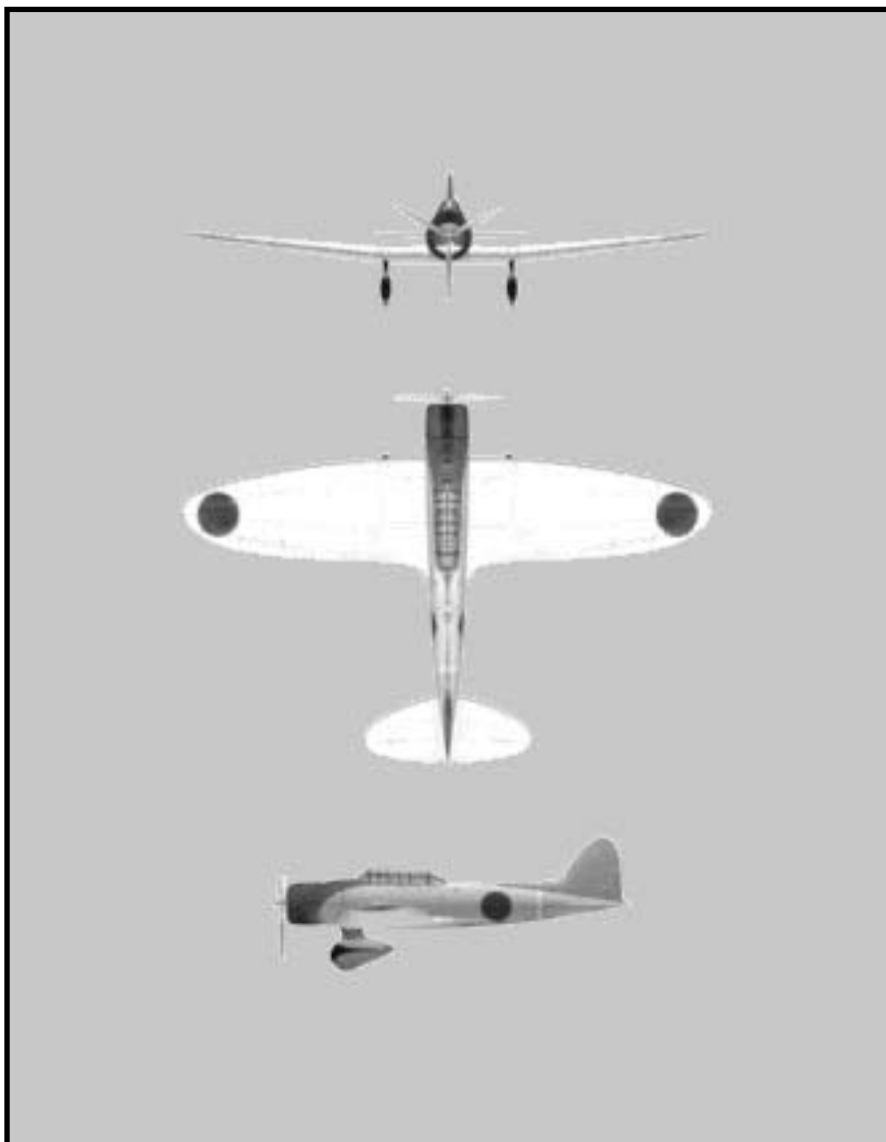
All of the guns on the Reisen have a slower firing rate than the American machine guns, and so will get the worst of any nose-to-nose approach. Dogfighting close with the Wildcats is the preferred strategy. The Hellcats will try hit and run tactics; do not allow them to stand off at a distance, as they are quite deadly.





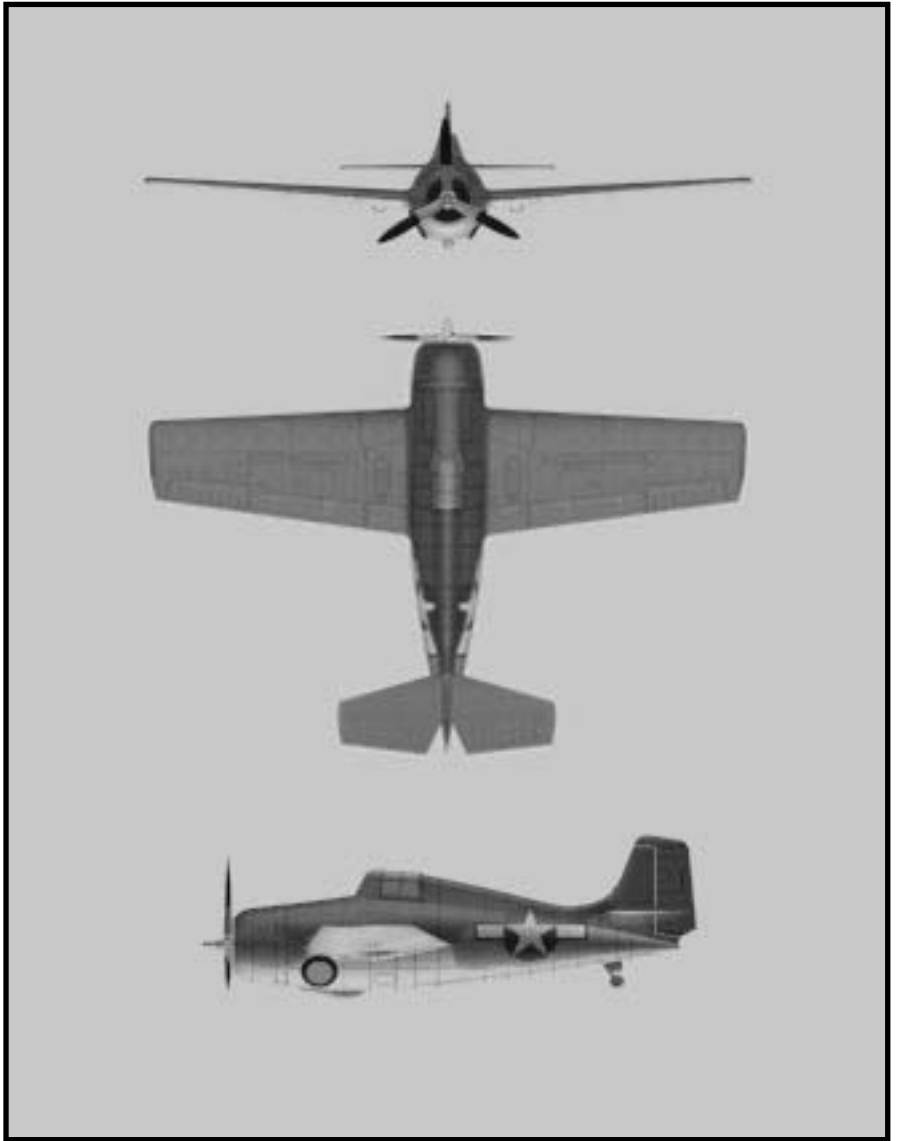
## ***“KATE” - THE NAKAJIMA B5N***

Class:	Type 97 Carrier-borne Attack Plane Model 12 (Torpedo bomber)
Stations:	Pilot, Rear Gunner
Weapons:	[Fixed] 1 or 2 Rear-mounted 7.7 mm Machine Guns [Payload] 1 Torpedo -or- 1800 lbs of Bombs
Ammunition:	1200 rd/gun
Firing Rate:	950-1000 rd/min (approx. 74 seconds of fire)
Span:	52' 5"
Length:	33' 9"
Wing Area:	37.7 sq. meters
Engine:	Nakajima Sakae 11 (Radial)
Max HPwr:	1000
Ceiling:	27,100 ft
Cruise Speed:	140 kts
Max. Spd:	204 kts
Stall Spd:	66 kts [Level Flight]
Std Fuel:	306 gal
Max Fuel:	306 gal
Pilots' Notes:	The Kate is quite a stable platform for torpedo bombing. The maneuverability is adequate, but certainly no match for a fighter in a one-on-one fight. The stall on the Kate is easily handled and not at all dramatic. This plane can take more punishment than a Reisen, but a successful run requires fighter cover.



## ***“VAL” - THE AICHI D3A***

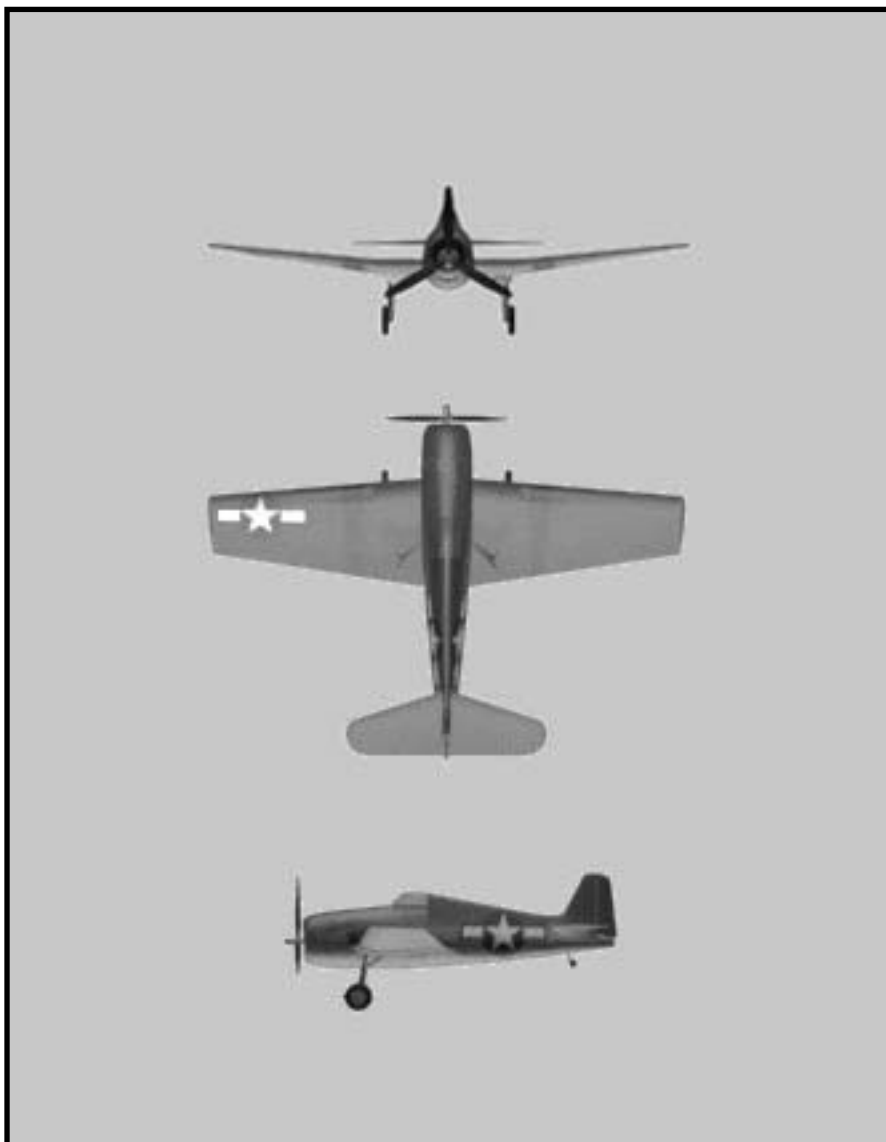
Class:	Type 99 Carrier-borne Bomber Model 22 (Dive Bomber)	
Stations:	Pilot, Rear Gunner	
Weapons:	[Fixed]	2 Cowl-mounted 7.7 mm Machine Guns 1 or 2 Rear mounted 7.7 mm Machine Guns
	[Payload]	850 lbs. of Bombs
	[Cowl]	400 rd/gun
Ammunition:	[Rear]	1200 rd/gun
	Firing Rate:	
	[Cowl]	950-1000 rd/min (approx. 25 seconds of fire)
	[Rear]	950-1000 rd/min (approx. 74 seconds of fire)
Span:	47' 8"	
Length:	34' 9"	
Wing Area:	34.9 sq. meters	
Engine:	Mitsubishi Kinsei 54 (Radial)	
Max HPwr:	1300	
Ceiling:	34,450 ft	
Cruise Speed:	160 kts	
Max. Spd:	232 kts	
Stall Spd:	67 kts [Level Flight]	
Std Fuel:	206 gal	
Max Fuel:	206 gal	
Pilots' Notes:	The Val has good handling characteristics, especially in a dive. The maneuverability is fair (better than the Dauntless), and the dives are quite steady. The maximum dive angle is, however, slightly shallower than that of the American bomber. Fixed landing gear and strong dive brakes make this bomber slow to accelerate, which is good for your aim in a steep dive.	



## ***“WILDCAT” - THE GRUMMAN F4F-3 AND F4F-4***

Class:	Fighter
Stations:	Pilot
Weapons:	[Fixed] 4 (F4F-3) or 6 (F4F-4) Wing-mounted .50 caliber Machine Guns
	[Payload] 2-100 lb. Bombs
Ammunition:	[F4F-3] 430 rd/gun
	[F4F-4] 240 rd/gun
Firing Rate:	750 rd/min (approx. 34 [F4F-3] and 19 [F4F-4] seconds of fire)
Span:	38'
Length:	28' 9"
Wing Area:	24.15 sq. meters
Engine:	Pratt and Whitney R-1830-86 (Radial)
Max HPwr:	1200
Ceiling:	34,000 ft
Cruise Speed:	140 kts
Max. Spd:	276 kts
Stall Spd:	77 kts (F4F-3) – 79 kts (F4F-4) [Level Flight]
Std Fuel:	117 gal (w/liner) -or- 130 gal (w/out liner)
Max Fuel:	246 gal
Pilots' Notes:	The F4F is a squat, ugly, tough bird. It's not as maneuverable as the Zeros, but it can take a lot more punishment. She's got some heavy firepower, too. Even with the right pilot behind the stick, though, a Wildcat is often not a match for a Zero. Take them on in teams only, never one-on-one.

The short take-off distance and strong gear make the Wildcat perfectly suited for carrier based operations. Be careful not to over-throttle on take-off, or you can lose steering and dump over the side. Her flying stability is pretty good, and the roll rate is fast.

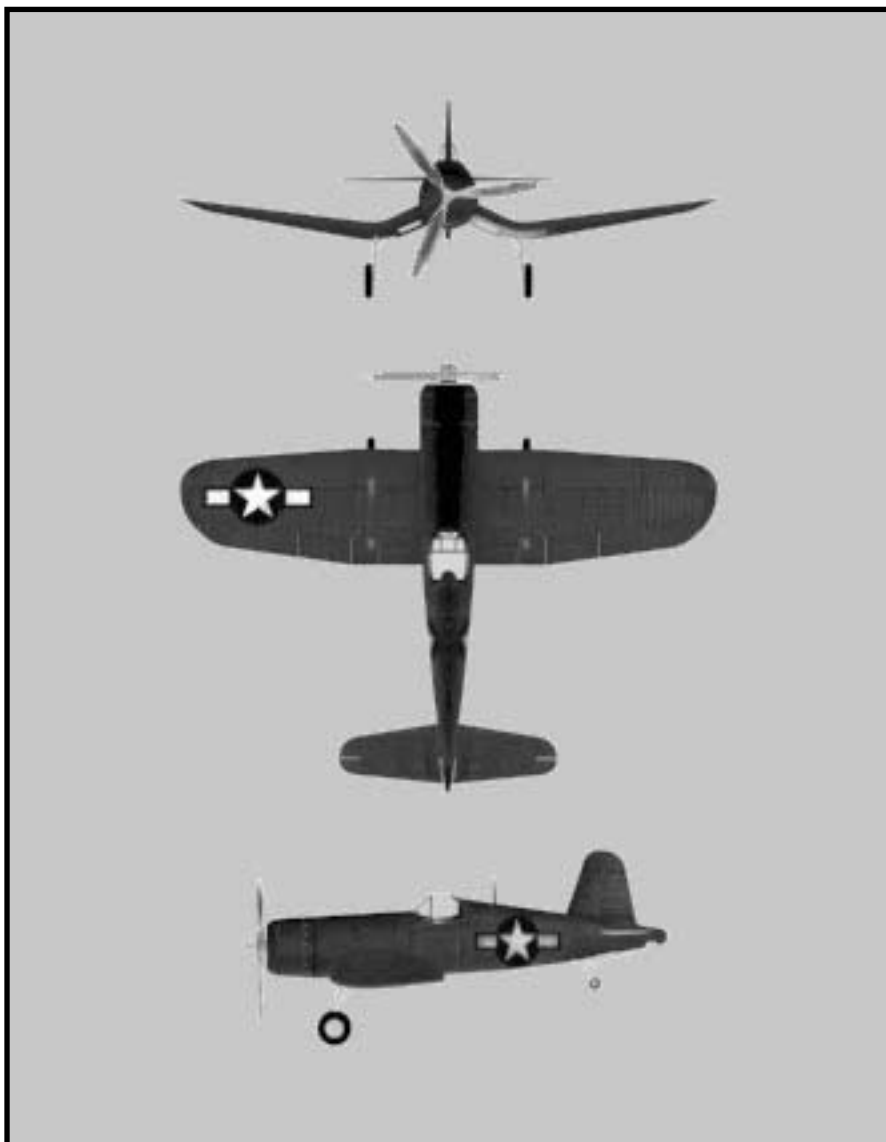


## ***“HELLCAT” - THE GRUMMAN F6F-3***

Class:	Fighter
Stations:	Pilot
Weapons:	[Fixed] 6 Wing-mounted .50 caliber Machine Guns
	[Payload] 2-500 lb. Bombs
	6-5” Rockets
Ammunition:	400 rd/gun
Firing Rate:	750 rd/min (approx. 32 seconds of fire)
Span:	42’ 10”
Length:	33’ 6”
Wing Area:	31.03 sq. meters
Engine:	Pratt and Whitney R-2800-10W (Radial)
Max HPwr:	2000
Ceiling:	35,500 ft
Cruise Speed:	155 kts
Max. Spd:	326 kts
Stall Spd:	84 kts [Level Flight]
Std Fuel:	250 gal
Max Fuel:	700 gal
Pilots’ Notes:	The Hellcat was specifically built to outmatch the Zekes. Grumman designed this fighter to take advantage of every known weakness of the Zeros. It’s faster and more maneuverable than the Wildcat, but without sacrificing any of the armor. The F6F’s extra firepower should be more than enough to bring a quick end to any duel.

It’s not pretty, but it turned the war in the Pacific around. Watch for sluggishness above 32,000 ft, and the controls get heavy at high speeds – not nearly as bad as in the Zero, though. Stalls happen suddenly, without much warning, but the Hellcat recovers easily. She’s rock-steady in a deck landing, but the heavy nose tends to drop as you’re coming in.

Never get lured into a close-in dogfight with a Zero; use repeated hit and run passes until you drop him.



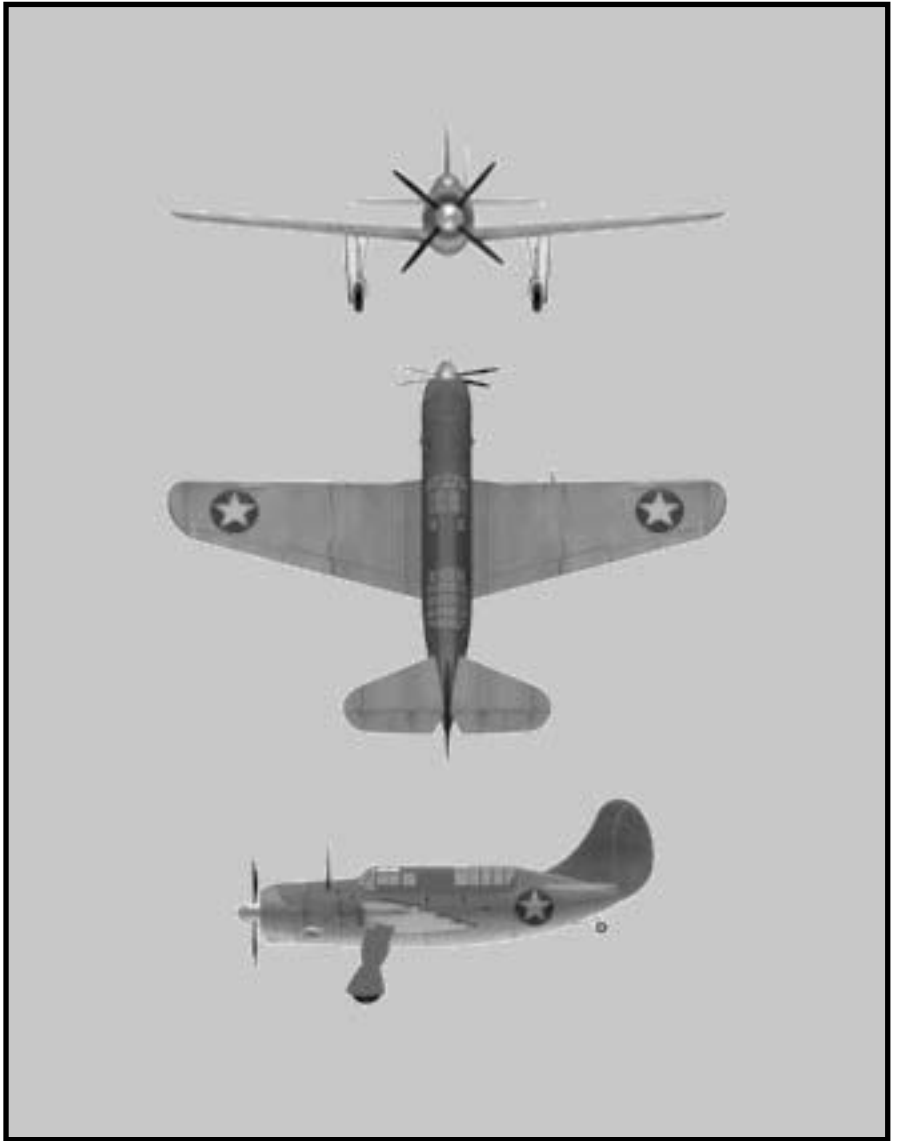


## ***“CORSAIR” - THE CHANCE VOUGHT F4U***

Class:	Fighter
Stations:	Pilot
Weapons:	[Fixed] 6 Wing-mounted .50 caliber Machine Guns
	[Payload] 1000 lbs. of Bombs
	8-5” Rockets
Ammunition:	[4 Inboard] 400 rd/gun
	[2 Outboard] 375 rd/gun
Firing Rate:	750 rd/min (approx. 32 seconds of fire)
Span:	40’ 11”
Length:	30’ 8”
Wing Area:	29.17 sq. meters
Engine:	Pratt and Whitney Double Wasp R-2800-18W (Radial)
Max HPwr:	2000
Ceiling:	36,900 ft
Cruise Speed:	218 kts
Max. Spd:	360 kts
Stall Spd:	88 kts [Level Flight]
Std Fuel:	237 gal
Max Fuel:	577 gal
Pilots’ Notes:	The Corsair is a forced marriage – the smallest airframe that can accommodate what was the most powerful radial engine in development at the time it was designed. It’s got great acceleration, but it’s heavy, so you won’t get the kind of climb rate you might expect. That engine gives out with some mighty torque, too, which is why the Navy avoids putting Corsairs on carriers. The difficulty of deck landings earned this plane its nickname – “The Ensign Eliminator”.

The cockpit on the Corsair is set further back than most, so your view ahead is pretty poor except when looking up. The controls are not really superbly balanced, either. The handbook recommends that you not stay inverted for more than 3 seconds, and so do I. When this baby stalls, you won’t get any warning. It stalls rough, and it puts you right into a spin.

The maneuverability is mediocre, especially at low speeds, but her roll rate is great. Corsairs are tough and hard to kill, and they’ve got the firepower you want up there. Just treat it like a Hellcat; don’t close with a Zero, pull hit and run passes.

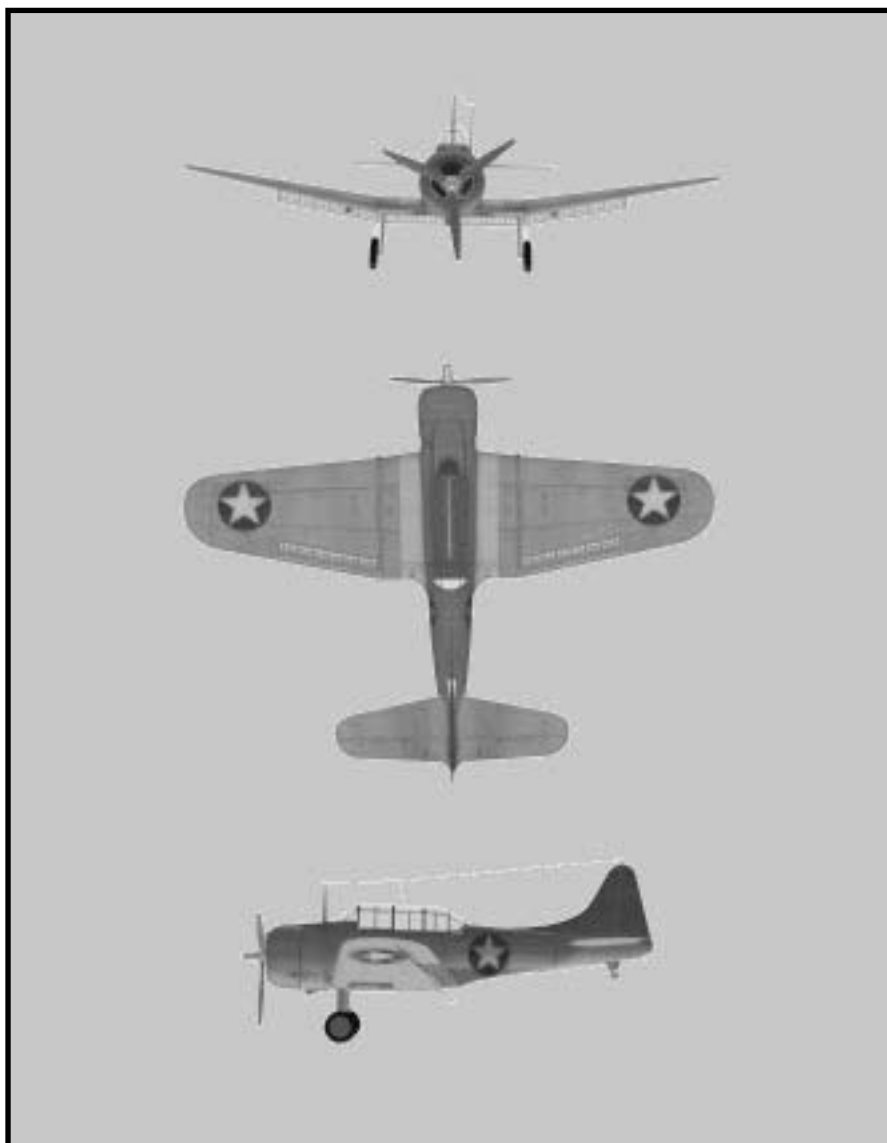


## ***“HELLDIVER” - THE CURTISS SB2***

Class:	Dive Bomber
Stations:	Pilot, Rear Gunner
Weapons:	[Fixed] 2 Wing-mounted 20 mm Cannon 2 Rear-mounted .30 caliber Machine Guns [Payload] 2000 lbs. of Bombs 6-5” Rockets
Ammunition:	[MGs] 2000 rd/gun [Cannon] 400 rd/gun
Firing Rate:	[MGs] 825 rd/min (approx. 145 seconds of fire) [Cannon] 450 rd/min (approx. 53 seconds of fire)
Span:	49’ 8.6”
Length:	36’ 8”
Wing Area:	39.2 sq. meters
Engine:	Wright Cyclone GR-2600-8
Max HPwr:	1700
Ceiling:	24,200 ft
Cruise Speed:	137 kts
Max. Spd:	244 kts
Stall Spd:	77 kts [Level Flight]
Std Fuel:	320 gal
Max Fuel:	566 gal

Pilots’ Notes: “Beast” is the right name for this bomber. Helldivers are plagued with handling problems. It’s often unstable, the elevators are heavy, and your forward vision is pretty poor, especially during take-off. It’s really not much better, in terms of performance, than the Dauntless, which it was designed to replace.

The Helldiver has a reputation among pilots as being hard to handle. That’s true, it is, but it’s a serviceable bomber. The Beast is very mild in a stall, though there’s really no warning of a stall ahead of time. It’s pretty stable in a dive, especially without the dive brakes. When you’re coming in for a landing, the heavy nose wants to drop, and most of the controls handle pretty poorly at low speeds. The one clear exception is the rudder. The gear never bounces, but I wouldn’t want to land one of these on a carrier deck too often.

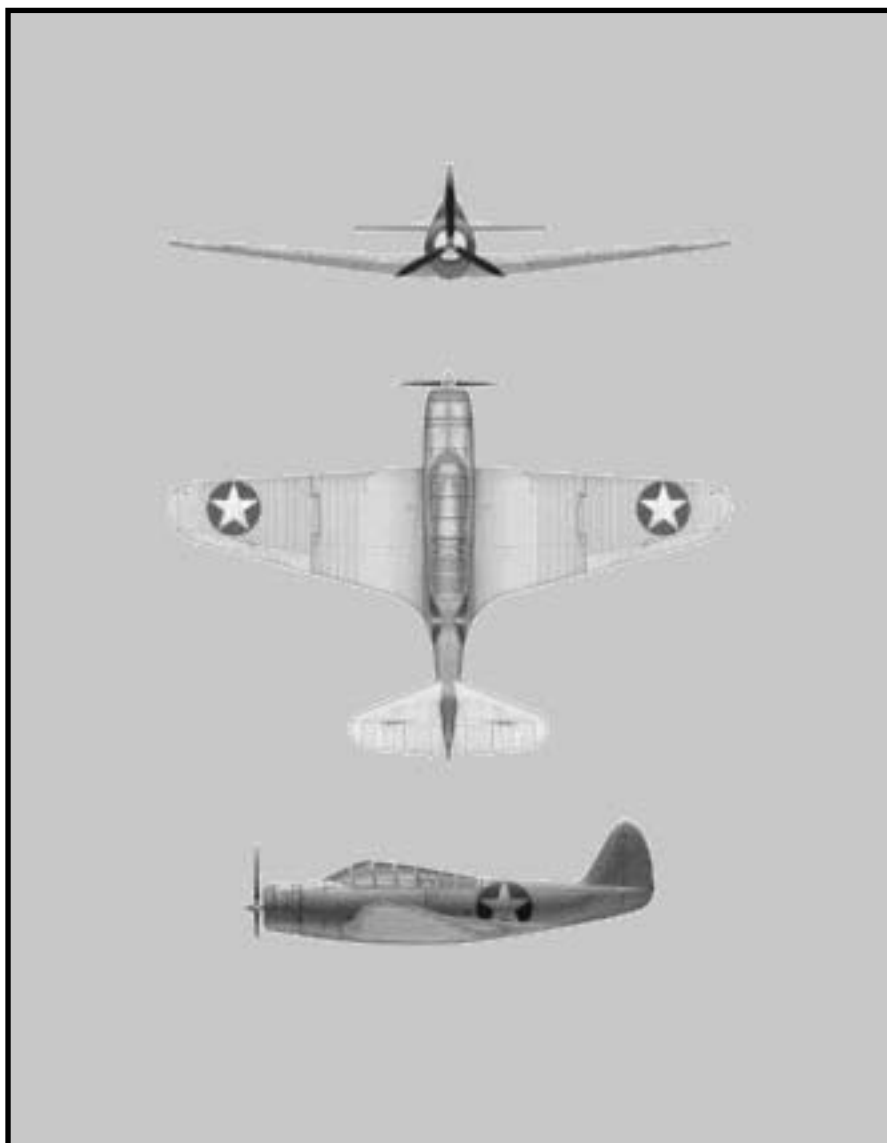


## ***“DAUNTLESS” - THE DOUGLAS SBD-3***

Class:	Scout Bomber	
Stations:	Pilot, Rear Gunner	
Weapons:	[Fixed]	2 Cowl-mounted .50 caliber Machine Guns
		2 Rear-mounted .30 caliber Machine Guns
	[Payload]	1000 lbs. of Bombs
Ammunition:	[Cowl]	360 rd/gun
	[Rear]	2000 rd/gun
Firing Rate:	[Cowl]	750 rd/min (approx. 29 seconds of fire)
	[Rear]	825 rd/min (approx. 145 seconds of fire)
Span:	41' 6.1"	
Length:	32' 1.25"	
Wing Area:	30.19 sq. meters	
Engine:	Wright Cyclone R-1820-52 (Radial)	
Max HPwr:	1000	
Ceiling:	27,100 ft	
Cruise Speed:	135 kts	
Max. Spd:	255 kts	
Stall Spd:	68 kts [Level Flight]	
Std Fuel:	260 gal	
Max Fuel:	310 gal	

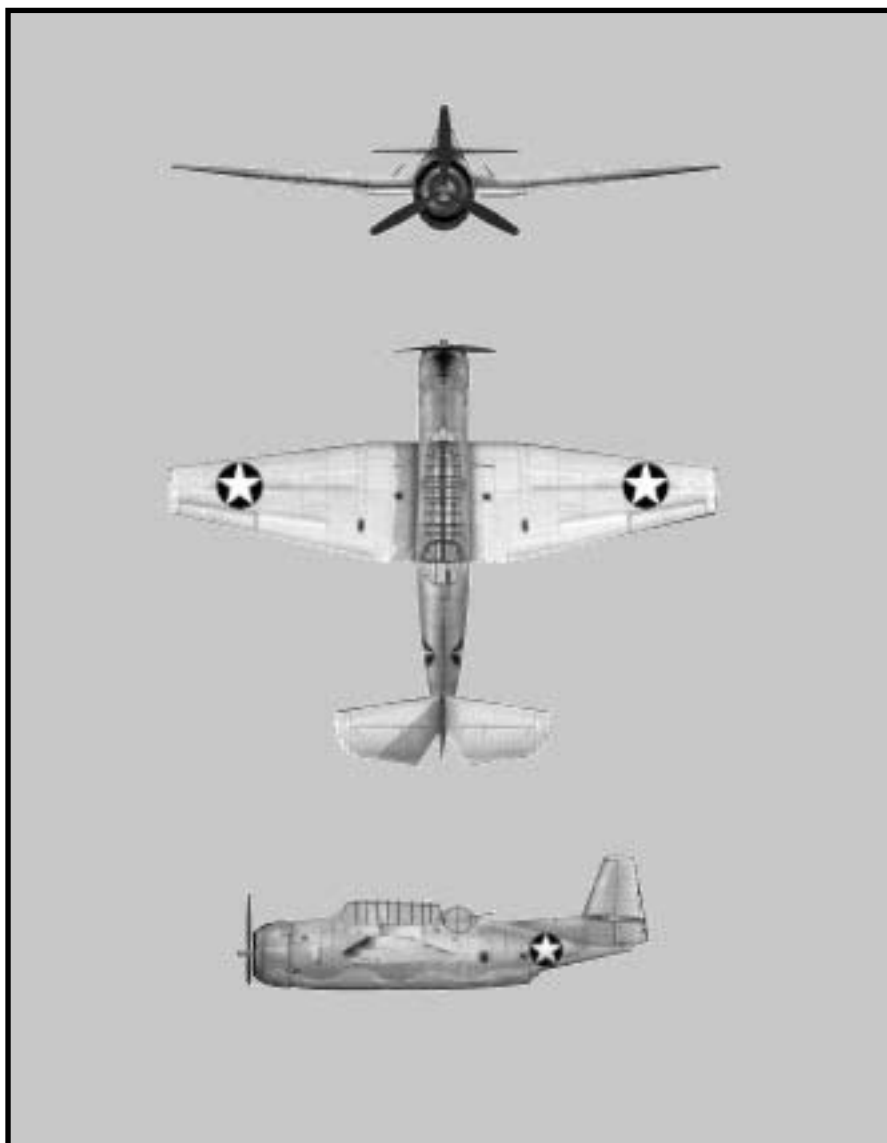
**Pilots' Notes:** The Dauntless is a workhorse, and has been all the way through the war. Even though it was designed before the U.S. got into things, and it's probably obsolete, it does the job. The engine's too small, so she's underpowered, but the handling is light and responsive. One thing you've got to remember is that the dive brakes go in and out really slowly. Start them out before you roll into your dive, and start them back in before you drop your explosive eggs. Otherwise, they won't really do their job.

The underpowered Dauntless is slow and lumbering on the take-off – her acceleration is not spectacular. The view over the nose is pretty good, though. When you're in a tight turn, especially to the left, watch out for her vicious g stall; sometimes she'll just snap out of the turn with no warning and try to go into a spin. If you're alert, you can avoid this. Dauntlesses are a dream to land. The gear's got a little bounce in it, but so what?



## ***“DEVASTATOR” - THE DOUGLAS TBD-1***

Class:	Torpedo Bomber	
Stations:	Pilot, Rear Gunner	
Weapons:	[Fixed]	1 Cowl-mounted .50 caliber Machine Gun
		2 Rear-mounted .30 caliber Machine Guns
	[Payload]	1 Torpedo -or- 1000 lbs. of Bombs
Ammunition:	[Cowl]	300 rd
	[Rear]	2000 rd/gun
Firing Rate:	[Cowl]	750 rd/min (approx. 24 seconds of fire)
	[Rear]	825 rd/min (approx. 145 seconds of fire)
Span:	50'	
Length:	32' 6"	
Wing Area:	35.31 sq. meters	
Engine:	Pratt and Whitney R-1830-64	
Max HPwr:	900	
Ceiling:	19,700 ft	
Cruise Speed:	128 kts	
Max. Spd:	178 kts	
Stall Spd:	54 kts [Level Flight]	
Std Fuel:	207 gal	
Max Fuel:	207 gal	
Pilots' Notes:	Some say that the Devastator was obsolete when it rolled off the assembly line. That makes sense, since it was designed way back in '34. It's a stable bombing platform, but the controls are heavy, slow, and not very responsive. Take-off is basically sound, but slow. The maneuverability stinks on ice. She can't fly high and she can't fly fast, but you've got great control at low speeds, which is important in a bomber. The one bright spot is that it's really a breeze to land one of these on the deck.	





## **“AVENGER” - THE GRUMMAN TBF**

Class:	Torpedo/Dive Bomber	
Stations:	Pilot, Dorsal Gunner, Ventral Gunner	
Weapons:	[Fixed]	2 Wing-mounted .50 caliber Machine Guns
		1 Dorsal .50 caliber Machine Gun
		1 Ventral .30 caliber Machine Gun
	[Payload]	1-22" Torpedo -or- 2000 lbs. of Bombs
Ammunition:	[Wing]	600 rd/gun
	[Dorsal]	400 rd
	[Ventral]	500 rd
Firing Rate:	[Wing]	750 rd/min (approx. 48 seconds of fire)
	[Dorsal]	750 rd/min (approx. 32 seconds of fire)
	[Ventral]	825 rd/min (approx. 36 seconds of fire)
Span:	54' 2"	
Length:	40'	
Wing Area:	45.54 sq. meters	
Engine:	Wright Cyclone GR-2600-8 (Radial)	
Max HPwr:	1700	
Ceiling:	21,400 ft	
Cruise Speed:	135 kts	
Max. Spd:	228 kts	
Stall Spd:	76 kts [Level Flight]	
Std Fuel:	380 gal	
Max Fuel:	771 gal	
Pilots' Notes:	Before I strapped in, they told me the Avenger was a torpedo bomber and a "level" dive bomber. I say, baloney. This here's a torpedo bomber, plain and simple. You get in a steep dive in this thing and you've got almost no maneuverability at all. You couldn't hit the broad side of a barn with the broad side of another barn. Now, in a nice, shallow torpedo run, she's steady as a rock. Handles a little heavy, but it's like that no matter how fast or slow you're going. One bad thing about that is your breakaway is kind of tough. You got to stomp all over the rudder to get anywhere near a clean break. Watch out, on account of she stalls pretty suddenly. There's no warning at all – just, bloop, and over she goes. When you get home, though, the touchdown's as easy as a deck landing gets. You can't miss with that giant arrestor hook.	



## **HISTORICAL OVERVIEW**

The air war fought over the Pacific ocean during World War II is unique in military history. For one thing, the vastness of this theater, stretching thousands of miles from Tokyo to San Francisco, from Australia to the Aleutians, sets it apart from most battlefields. The continent of Europe would be lost, swallowed whole, if superimposed over a map of the Pacific. Secondly, neither the Japanese offensive nor the subsequent American island-hopping campaign would have been possible without naval aviation.

The airplane came to dominate naval strategy. It became the principal means of striking out against the enemy's ships and land bases. The following overview is intended to place your flight career within the historical context of five Pacific battles. Regardless of which side you choose to play, you're forced to contend with certain historical events that are beyond your control. The information contained within this campaign narrative will help you in understanding why your missions play-out the way they do.

### **THE PRE-WAR YEARS**

After World War I, England and the United States emerged as the leading naval powers among western nations. With the defeat and dismantling of Germany's "luxury fleet", these two nations could fairly claim mastery of the seven seas. Japan, whose navy had crushed the Czar's fleet at Tsushima in 1905, was clearly the preeminent naval power in the Pacific (next to the U.S. Pacific fleet).

The tactics used by fleets in the Great War had progressed very little since Trafalgar. Admirals simply lined their ships up in long columns and hammered away at each other. The results were often disappointing, because capital ships were so expensive and their potential loss so devastating. No admiral was willing to take chances. Adm. Jellicoe, commanding the British ships at Jutland in 1916, was said to be, "the only man who could have lost the war in an afternoon." Naval engagements, therefore, were straightforward slug-fests with all the subtlety of a train wreck.

Early experiments with naval aviation were unimpressive. Despite this new innovation, the old guard among naval officers the world over continued to swear by the "big guns" of their capital ships. Ships capable of carrying aircraft would accompany a fleet, but only so that their aircraft could be used for reconnaissance.

After the enemy fleet was spotted from the air, battleships were expected to take over. Airplanes were considered superfluous once battle was joined. Victory would go to the side with the thickest armor, able to fire the greatest shell-weight at opposing ships.

After World War I, the imperial policies of Great Britain, Japan, and the United States were steaming a collision course. In 1921, representatives from the three governments met in Washington, D.C. to stave off an expensive naval arms race. The Washington Naval Conference reduced the total amount of tonnage the three nations could legally own to a simple ratio – 5:5:3. For every five tons of surface shipping possessed by the United States and Britain, Japan could own three. (France and Italy, the other two signatories, were each limited to a ratio of 1.67 tons under this agreement.)

To comply with the restrictions imposed by the Washington agreements, both the United States and Japan started a trend that would ultimately lead to the supremacy of naval aviation over the "big guns" theory. Each nation converted the half-finished hulls of two would-be battleships into aircraft-carrying ships.

According to the agreement, Britain and the United States were allowed to build up to 135,000 tons of aircraft-carrying ships. Japan was only allowed 81,000 tons. Each navy could construct two aircraft carriers of 33,000 tons; the rest were limited to only 27,000 tons.

For the United States, the two large carriers were the *U.S.S. Lexington* (CV-2) and *U.S.S. Saratoga* (CV-3). For Japan, the two large carriers were the *Akagi* and *Kaga*. Each of these four ships was capable of carrying over sixty (60) aircraft. (The two U.S. vessels eventually went to 36,000 tons, in violation of the agreement, because of their armored flight deck and hangars.) These ships formed the nucleus of the naval air war in the Pacific.

Both the United States and Japan continued to view aircraft-carrying ships as auxiliaries throughout the 1920s. Even after the first of the large carriers entered service, their aircraft were initially used as scouts. It wasn't until 1929 that the offensive potential of naval aviation was realized. (During a training exercise, the *Saratoga* launched a simulated sneak attack against the Panama Canal.)

While the United States conducted exercises during the 1930s, Japan was involved in the real thing. The on-going war with China gave its naval officers practical experience in handling aircraft carriers. Both the *Akagi* and *Kaga* were used to launch raids against the Chinese mainland near Hangchow.

By the mid-30s, the Washington Naval agreements were forgotten. Unhappy with the 5:5:3 ratio, Japan formally withdrew its compliance in 1936. Six new carriers had either already joined the Japanese fleet or were about to enter service. When construction of these carriers was completed, Japan would have a naval air arm of over 350 aircraft.

The United States entered World War II on December 7th, 1941, as a result of the Japanese raid on Pearl Harbor. The following list compares the carrier forces belonging to the United States and Japan on the eve of hostilities.

**THE CARRIER  
LINE-UP  
(DECEMBER 7TH  
1941)**

***JAPANESE CARRIER FORCE***

Ship	Displacement (t)	Aircraft	Entered Service
<i>Hosho</i>	7,470	15 aircraft	1922
<i>Akagi</i>	36,500	60 aircraft	1927
<i>Kaga</i>	38,200	65 aircraft	1928
<i>Ryujo</i>	10,600	36 aircraft	1933
<i>Soryu</i>	18,800	57 aircraft	1937
<i>Shoho</i>	11,262	30 aircraft	1939
<i>Zuiho</i>	17,260	27 aircraft	1940
<i>Hiryu</i>	20,300	62 aircraft	1941
<i>Zuikaku</i>	26,000	60 aircraft	1941
<i>Shokaku</i>	26,000	60 aircraft	1941
<i>Taiyo</i>	17,900	27 aircraft	1941
Totals	232,392 tons	499 aircraft	

***UNITED STATES CARRIER FORCE***

Ship	Displacement (t)	Aircraft	Entered Service
<i>Lexington</i>	39,000	72 aircraft	1927
<i>Saratoga</i>	39,000	72 aircraft	1927
<i>Ranger</i>	14,500	68 aircraft	1935
<i>Yorktown</i>	25,500	81 aircraft	1938
<i>Enterprise</i>	25,500	81 aircraft	1938
<i>Hornet</i>	29,100	85 aircraft	1940
<i>Wasp</i>	21,000	84 aircraft	1941
Totals	204,650 tons	543 aircraft	

(This list does not include the *U.S.S Langley*, which had been converted to a Seaplane Tender in 1938. At the time of the Japanese attack, only three U.S. carriers were stationed in the Pacific – the *Saratoga*, *Enterprise*, and *Lexington*.)

Although the Pearl Harbor raid is outside the scope of **1942 THE PACIFIC AIR WAR**, a brief description of this attack is in order. It changed many minds within the naval community about the value of naval aviation in a way the British raid on Taranto, the year before, failed to do. Pearl Harbor heralded a new age in naval warfare, an age in which the tiny airplane replaced the “big guns” of the convention surface fleets.

Admiral Isoroku Yamamoto, famed CinC (Commander-in-Chief) of Japan’s Combined Fleet, was the architect of the Pearl Harbor raid. Ironically, he had consistently counseled against going to war with America. Japan could run wild in the Pacific for six months following the raid, he warned, after which the industrial might of the United States would ultimately win the war. Nevertheless, he ordered Vice-Admiral Chuichi Nagumo, commander of the First Air Fleet, to proceed and carry out this historic strike.

The raid on Pearl Harbor was a stunning victory in planning and execution for the Japanese Navy. Six carriers (*Kaga*, *Akagi*, *Hiryu*, *Soryu*, *Shokaku*, and *Zuikaku*) launched 354 strike aircraft in a bid to destroy the USN in a surprise attack. Although the attack was carried out flawlessly, in a larger sense Japan had miscalculated badly. Rather than moving toward a negotiated peace, as was hoped, Americans used Pearl Harbor as a rallying cry of a type not heard since the Alamo.

The United States Pacific fleet was attacked by two successive waves of Japanese aircraft on the morning of December 7th, 1941. The first wave consisted of 50 Kates armed with torpedoes, 40 Kates armed with bombs, 51 Vals armed with bombs, and a covering force of 43 Zero fighters. The second wave began its attack at 0900 hours just as the first wave was retiring. It consisted of an additional 54 Kates armed with bombs, 80 Vals armed with bombs, and 36 Zero fighters. Most of the twenty-nine aircraft (9 Zeros, 15 Vals, 5 Kates) lost by the Japanese were out of this second wave.

As impressive as this victory might have seemed at the moment (all eight of the battleships at Pearl were sunk or damaged and over 300 aircraft were destroyed or damaged), the Japanese missed a chance to inflict a far more crippling blow.

Most of the damage done during the attack was centered on the battleships and heavy cruisers lying at anchor. Little attention was paid to Pearl Harbor’s adjacent facilities. The extensive dry dock and repair infrastructure was overlooked. Another vulnerable target, the tank farm storage area, with 4.5 million gallons of oil, was missed entirely. Had the tank farm and repair facilities been destroyed, the Pacific fleet would not have been in a position to challenge the Japanese advance through the South Pacific in 1942.

### ***JAPANESE PEARL HARBOR STRIKE FORCE***

#### **First Air Fleet**

(6) Aircraft Carriers: *Akagi*, *Hiryu*, *Kaga*, *Shokaku*, *Soryu*, and *Zuikaku*

(1) Light Cruisers: *Abukuma*

(9) Destroyers: *Akigumo*, *Arare*, *Isokaze*, *Hamakaze*, *Kasumi*, *Kagero*, *Shiranuhi*, *Tanikaze*, *Urakaze*

#### **Supporting Force**

(2) Battleships: *Hiei*, *Kirishima*

(2) Heavy Cruisers: *Chikuma*, *Tone*



*A Japanese bomb comes very close to hitting a U.S. carrier*

Fortunately for the United States, the most important target of all, the three Pacific fleet carriers, were away from Pearl Harbor at the time of the attack. Had one or more carriers been sunk at the outset, the Japanese would likely have taken Midway and the Solomon Islands (including Guadalcanal) in 1942. New Guinea would have been indefensible, and the Hawaiian islands would have been placed under siege. The American

counterattack in the Pacific would have started sometime in 1943, along the California coast.

By concentrating on the battleships, the Japanese had done the United States a favor. Pearl Harbor was a clear demonstration of the power of aircraft over surface vessels. The attack forced American naval leadership to forget about their battleships, as they would take too long to build anew. Unwittingly, the Japanese had expended their main effort against ships that would soon be overshadowed by naval aviation. From now on, all eyes turned to the aircraft carrier as the thing of the future.

**THE BATTLE  
OF THE  
CORAL SEA:  
4-8 MAY  
1942**

At Pearl Harbor, the Japanese missed their best opportunity to sink the American aircraft carriers. The consequences of this failed attempt would not become apparent until several months later, at the battle of Coral Sea. Less than six months later, in May 1942, the United States stemmed the tide of Japanese expansion, just as Yamamoto had predicted.

In an effort to extend their defensive perimeter farther south toward Australia, the Japanese fell victim to what was later termed “victory disease”—the belief in their own invincibility. To hold on to their conquered territory, military necessity required that they advance beyond their original war aims. Using their base at Rabaul in the Bismarck Archipelago as a starting point, the Japanese set in motion an operation designed to capture Port Moresby, a key Allied port and airbase. Port Moresby, located on the southwest coast of New Guinea, was the last defensible position between the Japanese and Australia.

The battle of the Coral Sea went down in history as the first naval engagement in which ships of the opposing fleets never sighted one other. This battle was conducted entirely from the air. Naval aviation had made it possible. Success in the upcoming operation in the South Pacific was considered a foregone conclusion.

Admiral Shigeyoshi Inouye, the Japanese commander, divided his forces (as outlined in the order of battle below) into five task groups. The Port Moresby task groups were directed to conduct an amphibious landing and capture the allied base

in mid-May. The remaining ships, including the carriers, had the job of seeking out and destroying any allied naval force daring to interfere.

Admiral Chester Nimitz, CinC of the U.S. Pacific Fleet, had been warned in advance of the impending attack. (The cryptographic team at Pearl Harbor had successfully broken the Japanese Navy's JN25b code.) Realizing that there were too few land-based aircraft at Port Moresby and Australia to stop this attack, Nimitz was prepared to gamble with his precious carriers.

The Coral Sea campaign opened on May 3rd, with the Japanese landing a small force on the island of Tulagi, north of Guadalcanal. A seaplane base was immediately established in its protected shallow water anchorage. The very next morning, aircraft from the *Yorktown* struck the base. Twelve (12) torpedo planes and twenty-eight (28) dive bombers only managed to



*A destroyer burns in the Pacific*

sink the *Kikuzuki* and damage the *Okinoshima*. After launching a second strike which sank the transport *Tama Maru*, Task Force 17 withdrew to the south in order to refuel and link up with Task Force 11 (Admiral Fitch's *Lexington* group).

Throughout the first week in May, the Japanese Carrier Strike Force hurried south from its naval base at Truk. By May 5th, it had rounded the island of San Cristobal and entered the Coral Sea. Now both of the opposing carrier groups were in place, desperately searching for some sign of the enemy. Victory would likely go to the side which found the other first.

### ***JAPANESE ORDER OF BATTLE***

#### **Carrier Strike Force (Takagi)**

- (2) Aircraft Carriers: *Shokaku*, *Zuikaku* (with 42 VF, 41 VB, 21 VT)
- (2) Heavy Cruisers: *Haguro*, *Myoko*
- (6) Destroyers: *Akebono*, *Ariake*, *Shigure*, *Shiratsuyu*, *Ushio*, *Yugure*
- (1) Fleet Oiler: *Toho Maru*

#### **Support Force (Goto)**

- (4) Heavy Cruisers: *Aoba*, *Furutaka*, *Kako*, *Kinugasa*

#### **Port Moresby Attack Force (Kajioka)**

- (1) Light Cruisers: *Yubari*
- (6) Destroyers: *Asanagi*, *Mochizuki*, *Mutsuki*, *Oite*, *Uzuki*, *Yayoi*

#### **Port Moresby Close Covering Force (Marumo)**

- (2) Light Cruisers: *Tatsuta*, *Tenryu*
- (1) Seaplane Tender: *Kamikawa Maru*

Port Moresby Close Support Force (Goto)  
(1) Light Carrier: *Shoho* (with 12 VF, 9 VT)  
(1) Destroyer: *Sazanami*

Transport Force (Abe)  
(1) Minelayer: *Tsugaru*  
(12) Transports

Tulagi Invasion Force (Shima)  
(2) Destroyers: *Kikuzuki*, *Yuzuki*  
(2) Minelayers: *Koei Maru*, *Okinoshima*  
(1) Transport: *Tama Maru*

### **UNITED STATES ORDER OF BATTLE**

Task Group 17.5 (Fletcher and Fitch)  
(2) Aircraft Carriers: *Lexington*, *Yorktown* (with 42 VF, 74 VB, 25 VT)  
(5) Heavy Cruisers: *Astoria*, *Chester*, *Minneapolis*, *New Orleans*, *Portland*

(9) Destroyers: *Anderson*, *Aylwin*, *Dewey*, *Farragut*, *Hammann*, *Phelps*,  
*Monaghan*, *Morris*, *Russell*

Task Group 17.3 (Crace)  
(3) Heavy Cruisers: *Australia* (RAN), *Chicago*, *Hobart* (RAN),  
(2) Destroyers: *Perkins*, *Walke*

Task Group 17.6 (Phillips)  
(2) Oilers: *Neosho*, *Tippecanoe*  
(2) Destroyers: *Sims*, *Worden*

Task Group 17.9 (Debaun)  
(1) Seaplane Tender: *Tangier*

On the morning of May 7th, search planes from the Japanese carrier force spotted the fleet oiler *Neosho* and destroyer *Sims*. Mistaking the *Neosho* for an aircraft carrier, the Japanese launched an all-out strike. The destroyer was sunk immediately after suffering three bomb hits. The oiler was crippled and finally sunk four days later by friendly ships.

While Takagi's planes were engaged, however, search planes from the American carriers located Goto's Close Support Force, which included the light carrier *Shoho*. Thinking they had found the main Japanese carrier force, the two U.S. carriers launched a combined strike consisting of ninety-three (93) aircraft. By the time Fletcher discovered his mistake, it was too late. Still, his aircraft attacked and sank the *Shoho*, now only ninety miles north of the American carriers. The sailors aboard the ships of Task Force 17 went wild when over the radio came the cry, "Scratch one Flattop!" The *Shoho* was gone, giving the Americans their first taste of victory.



The next day battle was rejoined in earnest. With the sinking of the *Shoho*, each side now possessed two carriers. Overnight, the two opposing carrier groups had closed to within 200 miles of each other – a mere stone's throw. By sunrise, search planes from the both groups had already found the enemy. The stage was set.

Both sides exchanged strikes on May 8th. The American planes found the Japanese carriers and attacked first. The strike actually consisted of less aircraft than had attacked the *Shoho* the day before (39 from the *Yorktown*, 43 from *Lexington*). This time the aircraft were destined to run into much heavier opposition. The *Zuikaku* protected itself by sailing into a rain squall. This left the *Shokaku*, about eight miles away, to receive the full weight of the attack. When it was over, the *Shokaku* had suffered several bomb hits, knocking it out of action.

The strike had arrived too late, however. The Japanese had already launched a strike of their own, made up of a mix of torpedo and dive bombers. Though fewer in number than the American strike (about seventy aircraft), the Japanese crews were experienced, most of them with over 700 hours of combat flight time.

Arriving over the American fleet, the Japanese strike broke into well-rehearsed attack formations. The *Lexington* was hit by two bombs and two torpedoes, which started fires below deck, forcing her evacuation. The destroyer *Phelps* was eventually called in to sink the “Lady Lex”. The *Yorktown* was also hit but the damage was not as severe. A single bomb had penetrated its flight deck, but flight operations were unaffected.

After the mutual strikes on May 8th, both sides retired from the field. According to the numbers, Coral Sea was a Japanese victory. They had traded the *Shoho* (a light carrier) for the *Lexington* and damage to a second carrier. True, both the *Zuikaku* and *Shokaku* would be out of action for several months (the “Zui” while replacing flight crews, the “Sho” while repairing damage), but the Americans had lost one of their



*A U.S. destroyer with serious damage*

**THE BATTLE OF  
MIDWAY 4-6 MAY  
1942**

fleet carriers, reducing their total carrier strength in the Pacific to only three.

Numbers don't tell the whole story behind the Coral Sea campaign, however. Without the carrier strike force to protect them, the Japanese transports sailed back to Rabaul without landing at Port Moresby. For the first time in the war, the United States had turned back a Japanese invasion.

This set-back convinced Yamamoto that the decisive battle with the U.S. Pacific fleet needed to be fought. He knew that only by attacking an area the Americans considered strategically vital could he force the remaining American ships to fight. The area he chose was the island of Midway. He reasoned correctly that Admiral Nimitz would commit his fleet rather than risk losing Midway and jeopardizing the Hawaiian islands.

The Midway campaign was aimed at luring the United States Navy away from its home ports and out from under the protective cover of land-based aircraft. Once at sea, the American ships would be ambushed as they came forth to do battle.

The main attack would be aimed at Midway island. Aircraft from Yamamoto's carriers would first destroy any land-based aircraft found on the island. Then, his invasion force would land five thousand occupation troops on the island, capturing its airfields. With Midway out of the way, his plan to destroy the American fleet as it moved in would not be interfered with.

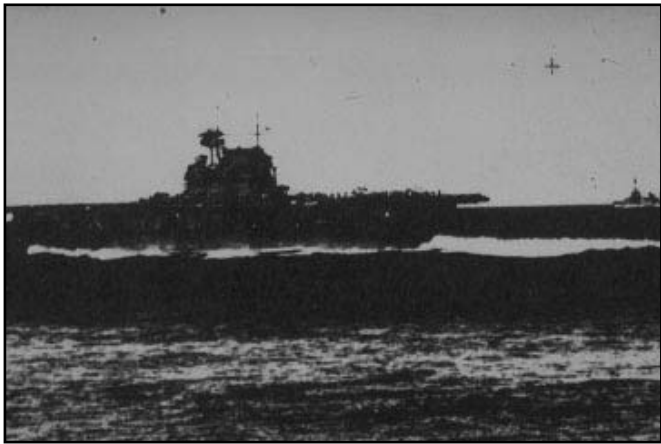
The plan was risky and required careful timing. However, given the overwhelming strength of the Imperial Japanese Navy (IJN), the American fleet should have had little chance. Yamamoto believed that he would be facing only two American carriers after the damage done to the *Yorktown* at Coral Sea. In fact, he would be facing three. Instead of enjoying a 2 to 1 advantage in fleet carriers, the odds were reduced

to 4 to 3.

Assigned to the operation were the four big fleet carriers (*Akagi*, *Kaga*, *Soryu*, and *Hiryu*). The "Sho" and "Zui", recovering from the Coral Sea engagement, would be sorely missed. Two light carriers (*Zuiho* and *Hosho*) were included in Adm. Kondo's supporting force. All told, the six Japanese carriers had some 277 strike aircraft aboard.

Facing this force were three U.S. carriers with some 233 aircraft aboard and another 70 aircraft based at Midway. Included in the U.S. order of battle was the damaged carrier *Yorktown*. By rights, the *Yorktown*

should have been laid up for at least three months. But instead of three months, the repair crews at Pearl Harbor had performed a miracle. The ship was fixed in just 36



*June 4, 1942 - The Enterprise at high speed during the Battle of Midway*

hours, in time to put to sea with the others.

Aside from this unexpected addition to its order of battle, the United States Navy had another, even more important, ace in the hole. American naval officers were well informed of the Japanese plans, because U.S. intelligence analysts had long since cracked the Japanese naval codes. Only one out of every ten words was actually being decoded and translated, but this was enough to discern Yamamoto's intentions.

Rear Admiral Raymond Spruance replaced Vice-Admiral Halsey (who had been hospitalized with a skin disease after Coral Sea) as commander of Task Force 16. Spruance, a former cruiser skipper with no prior experience at commanding aircraft carriers, would exercise ultimate tactical authority over the American fleet.

### ***JAPANESE ORDER OF BATTLE***

First Mobile Force, Carrier Strike Force (Nagumo)

- (4) Aircraft Carriers: *Akagi, Hiryu, Kaga, Soryu* (with 93 VF, 85 VB, 93 VT)
- (2) Battleships: *Haruna, Kirishima*
- (2) Heavy Cruisers: *Chikuma, Tone*
- (1) Light Cruiser: *Nagara*
- (12) Destroyers: *Arashi, Akigumo, Hagikaze, Hamakaze, Isokaze, Kazagumo, Maikaze, Makigumo, Nowaki, Tanikaze, Urakaze, Yugumo*

First Fleet, Main Body (Yamamoto)

- (1) Light Carrier: *Hosho* (with 8 VT)
- (3) Battleships: *Nagato, Mutsu, Yamato*
- (1) Light Cruiser: *Sendai*
- (9) Destroyers: *Ayanami, Fubuki, Hatsuyuki, Isonami, Murakumo, Shikinami, Shirayuki, Uranami, Yukaze*

Second Fleet, Main Body (Kondo)

- (1) Light Carrier: *Zuiho* (with 12 VF, 11 VB)
- (2) Battleships: *Hiei, Kongo*
- (4) Heavy Cruisers: *Atago, Chokai, Haguro, Myoko*,
- (1) Light Cruiser: *Yura*
- (8) Destroyers: *Asagumo, Harusame, Mikazuki, Minegumo, Murasame, Natsugumo, Samidare, Yudachi*
- (4) Fleet Oilers

Second Fleet, Escort Force (Tanaka)

- (1) Light Cruiser: *Jintsu*
- (11) Destroyers: *Amatsukaze, Arare, Hatsukaze, Kagero, Kasumi, Kuroshio,*

*Oyashio, Tokitsukaze, Shiranuhi, Yukikaze,*  
(15) Transport ships with 5,000 troops

Second Fleet, Occupation Support Force (Kurita)

(2) Seaplane Tenders: *Chitose, Kamikawa Maru*

(4) Heavy Cruisers: *Kumano, Mogami, Mikuma, Suzuya*

(3) Destroyers: *Arashio, Asashio, Hayashio*

Special Duty Force

(2) Seaplane Tenders: *Chiyoda, Nisshin*

First Supply Force

(1) Destroyer: *Ariake*

(2) Freighters

### ***UNITED STATES ORDER OF BATTLE***

Task Force 16.5 (Spruance)

(2) Aircraft Carriers: *Enterprise, Hornet* (with 54 VF, 77 VB, 29 VT)

(5) Heavy Cruisers: *New Orleans, Minneapolis, Northampton, Pensacola,*  
*Vicennes*

(1) AA Light Cruiser: *Atlanta*

Task Group 16.4 (Early)

(11) Destroyers: *Aylwin, Balch, Benham, Conyngham, Dewey, Ellet, Phelps,*  
*Maury, Monaghan, Monssen, Worden*

Task Force 17 (Fletcher)

(1) Aircraft Carrier: *Yorktown* (with 25 VF, 37 VB, 13 VT)

Task Group 17.2 (Smith)

(2) Heavy Cruisers: *Astoria*, *Portland*

Task Group 17.4 (Hoover)

(6) Destroyers: *Anderson*, *Gwin*, *Hammann*, *Hughes*, *Morris*, *Russell*

Fleet Train (Thurber)

(2) Destroyers: *Blue*, *Ralph Talbot*

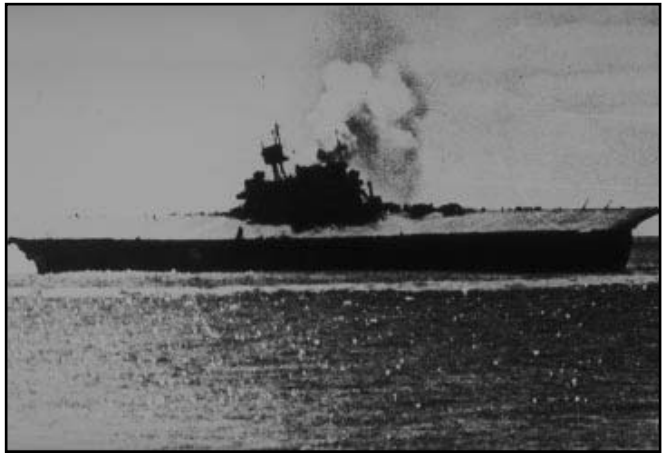
(1) Fleet Oiler

French Frigate Shoal Force

(1) Destroyer: *Clark*

According to the operational plan, Adm. Nagumo opened the campaign with an airstrike against Midway. The attack inflicted some damage, but the need for a follow-up strike was immediately recognized. The situation posed somewhat of a tactical dilemma for Nagumo. Should he order a second attack on Midway or arm his planes with torpedoes for use against any American ships that might be in the area? Now down to 167 operable aircraft, Nagumo decided to attack Midway a second time.

While rearming for a second strike, Nagumo's carriers were spotted by American search planes. Within an hour of this sighting, the *Enterprise* and *Hornet* had launched an airstrike. Spruance hoped to catch the Japanese carriers with their guard down, while the bulk of their air cover was attacking Midway. Although losses were high among the attacking aircraft, the strike caught the decks of the Japanese carriers full of gas and bombs. It was devastating.



In the space of five minutes, three of Yamamoto's four carriers were ablaze. *A damaged Yorktown, listing badly*

Only the *Hiryu* managed to escape this attack by ducking into a rain squall. Secondary explosions aboard the *Akagi*, *Kaga*, and *Soryu* turned them into flaming, sinking wrecks. The odds had been shifted dramatically in favor of the Americans, but the battle was not yet over. The undamaged *Hiryu* proceeded to launch an attack which claimed the *Yorktown*.

With three Japanese carriers on the way to the bottom, all attention was turned to the lone *Hiryu*. In contrast to the great aerial armada that had been assembled to

**THE BATTLE  
OF THE  
EASTERN  
SOLOMONS:  
24-25  
AUGUST  
1942**

deal with Midway only hours before, less than twenty aircraft remained. To fend off further American raids, the *Hiryu* had a mere six Zeros.

Nagumo did not have long to wait. Shortly after he transferred his flag aboard, the *Hiryu* was attacked by dive bombers from the *Hornet* and *Enterprise*. After taking four bomb hits in quick succession, the *Hiryu* exploded into flames. The last of Nagumo's carriers was sent to join the others at the bottom of the Pacific. Yamamoto now had no real choice but to order a general withdrawal, otherwise his surface ships would be at the mercy of American air power.

Midway had turned out to be the decisive naval engagement of the war. Losses had been inflicted on Japan's navy that its industrial base could not make good. From now until the end of the war, Japan would assume a defensive posture. Whereas the battle of the Coral Sea had halted their advance, Midway turned it back.

Guadalcanal sits at the southeastern end of the Solomon Islands archipelago. In 1942, the island became the focal point of the whole Pacific war. It was the place where Japan had decided to build an airbase, to resume their advance in the South Pacific. It was also the place where the United States decided to begin rolling back the Japanese advance.

On August 7, the 1st Marine Division invaded Guadalcanal and captured the partially completely airbase. After chasing off the few Japanese on the island, the Leathernecks settled in to defend the airstrip they named "Henderson Field". Most of the prisoners taken by the Marines turned out to be Korean laborers working to complete the airstrip.

The ease of the initial landing was deceptive. Guadalcanal would not be taken for many more months. The Solomons campaign lasted from August of '42 through February of '43. It was one of the toughest, most prolonged contests of the Pacific war, not only on land but at sea as well.

The fighting on land required a steady stream of reinforcements and supplies. Without domination of the surrounding seas, this stream could be cut at any time, isolating the troops ashore. From August 1942 on, both sides sought to control the situation at sea. Seven major sea battles were fought during this time, two of these battles – the Eastern Solomons engagement and the battle of Santa Cruz – involved aircraft carriers.

The Battle of the Eastern Solomons began on August 23rd, 1942, just two weeks after the initial Marine landing. As he had tried to do at Midway, Admiral Yamamoto was determined to lure the American carriers into a decisive engagement and destroy them. He assigned the destruction of the American carriers to the Third Fleet's Carrier Strike Force, commanded by Admiral Nagumo.

A secondary concern was the Marine beachhead on Guadalcanal and the land-based aircraft that would eventually make their way to Henderson Field. It was clear that the entire campaign would be influenced by whichever side held the tiny airstrip. Accordingly, Yamamoto planned to send reinforcements to the island while his carriers kept the Americans busy. Once Henderson Field was in Japanese hands, the Marines on the island would "wither and die on the vine".

The light carrier *Ryujo* was assigned to Rear Admiral Chuichi Hara's Detached Carrier Strike Force. It was Hara's job to suppress the American air forces on Henderson Field and support the Japanese landings. In retrospect, it is possible that Yamamoto was using the *Ryujo* as bait to lure the American carriers out to battle (just as the *Shoho* had unintentionally done at Coral Sea).

Admiral Nimitz was well aware that the Japanese were committing the bulk of their Combined Fleet to battle in the Solomons. On August 23rd, Adm. Fletcher's ships were lying off the eastern end of Guadalcanal, sending out scouts in hopes of

locating the Japanese carriers.

Thinking he had plenty of time before the Japanese force arrived in the area, Fletcher detached the *Wasp* south to refuel. This move left him with only the *Enterprise* and *Saratoga* to oppose the three Japanese carriers. Actually, the Japanese carriers were much closer than he thought.

A PBY (search plane) on reconnaissance patrol from Ndeni Island reported spotting the Japanese light carrier *Ryujo*. Fletcher believed the report to be false. Later, a second PBY spotted the *Ryujo* again. Fletcher could not ignore this second sighting and ordered an attack.

The first wave of dive bombers failed to score a hit, but a group of TBF Avengers damaged the *Ryujo*'s rudder with a torpedo. A second group of dive bombers pounded the now helpless carrier with four 1,000 lb. bombs, setting her ablaze. The *Ryujo* sank four hours later. Not a single American plane was lost in the attack.

### ***JAPANESE ORDER OF BATTLE***

Combined Fleet (Yamamoto)

Third Fleet, Carrier Strike Force (Nagumo)

(2) Aircraft Carriers: *Shokaku*, *Zuikaku* (with 53 VF, 41 VB, 36 VT)

(6) Destroyers: *Akigumo*, *Akizuki*, *Hatsukaze*, *Kazagumo*, *Makigumo*, *Yugumo*

Third Fleet, Detached Carrier Strike Force (Hara)

(1) Light Carrier: *Ryujo* (with 16 VF, 21 VT)

(1) Heavy Cruiser: *Tone*

(2) Destroyers: *Amatsukaze*, *Tokitsukaze*

Second Fleet, Support Force (Abe)

Vanguard Force, Close Support

(2) Battleships: *Hiei*, *Kirishima*

(3) Heavy Cruisers: *Chikuma*, *Kumano*, *Suzuya*

(1) Light Cruiser: *Nagara*

(3) Destroyers: *Maikaze*, *Nowaki*, *Tanikaze*

Support Force, Main Body (Kondo)

- (1) Seaplane Tender: *Chitose* (with 22 floatplanes)
- (1) Battleship: *Mutsu*
- (5) Heavy Cruisers: *Atago, Haguro, Maya, Myoko, Takao*
- (1) Light Cruiser: *Yura*
- (9) Destroyers: *Asagumo, Harusame, Hayashio, Kuroshima, Minegumo, Murasame, Natsugumo, Oyashio, Samidare*

Eighth Fleet (Mikawa)

Close Cover Force

- (4) Heavy Cruisers: *Aoba, Chokai, Furutaka, Kinugasa*

Convoy Escort Force (Tanaka)

- (1) Light Cruiser: *Jintsu*
- (8) Destroyers: *Isokaze, Kagero, Kawakaze, Mutsuki, Suzukaze, Umikaze, Uzuki, Yayoi*

**UNITED STATES ORDER OF BATTLE**

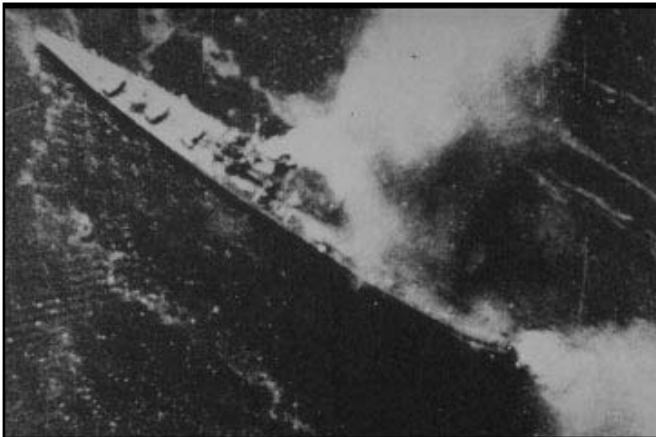
Task Force 61 (Fletcher)

Task Force 11

- (1) Aircraft Carrier: *Saratoga* (with 36 VF, 36 VB, 15 VT)
- (2) Heavy Cruisers: *Minneapolis, New Orleans*
- (5) Destroyers: *Dale, Farragut, McDonough, Phelps, Worden*

Task Force 16 (Kinkaid)

- (1) Aircraft Carrier: *Enterprise* (with 36 VF, 36 VB, 15 VT)
- (1) Battleship: *North Carolina*



*Direct hit on a Japanese heavy cruiser at Rabaul harbor*

- (1) Heavy Cruiser: *Portland*
- (1) AA Light Cruiser: *Atlanta*
- (6) Destroyers: *Balch, Benham, Ellet, Grayson, Maury, Monssen*

Task Force 18 (Noyes)

- (1) Aircraft Carrier: *Wasp* (with 28 VF, 36 VB, 15 VT)
- (2) Heavy Cruisers: *San Francisco, Salt Lake City*
- (1) Light Cruiser: *San Juan*
- (6) Destroyers: *Aaron Ward, Buchanan, Farenholt, Stack, Sterret, Selfridge*

While the attack on the *Ryujo* was under way, Nagumo launched his own attack against the two American carriers. (Intentional or not, the sacrifice of the *Ryujo* seemed to have the desired effect.) The first wave of Japanese aircraft hit



the *Enterprise* with three bombs, causing heavy damage. Although the *Enterprise* was on fire, it still maintained hull integrity and was in little danger of sinking. Aircraft from the stricken carrier flew to Guadalcanal to bolster the air defenses there.

In the last major carrier action of the day, two American dive bombers spotted and bombed the Japanese seaplane carrier *Chitose*. Although they never actually hit the ship, the near-misses set the planes on deck afire and damaged the engine room. The *Chitose* started to list badly. Only quick thinking on the part of her Captain saved the ship from sinking.

The next day, American aircraft attacked three Japanese troop transports as they made a daylight run for Guadalcanal. Tanaka's flagship, the light cruiser *Jintsu* and one of the transports were damaged. Tanaka was forced to withdraw without landing any reinforcements. The battle was over.

The battle of the Eastern Solomons was a clear tactical victory for the Americans. The Japanese had failed to achieve either one of their two primary objectives. The American carriers had not been eliminated, and Henderson Field still belonged to the 1st Marine Division.

At sea, the *Enterprise* had been damaged, but only twenty aircraft had been lost. The Japanese, on the other hand, had lost a light carrier and close to 90 planes. Carrier odds that had started out overwhelmingly in Japan's favor were continuing to even out after each battle.

On the homefront in both United States and Japan, Guadalcanal came to have a symbolic importance far greater than its real tactical value. Neither side was willing to give an inch; both fed reinforcements into this lengthy battle of attrition.

Yamamoto's dream of victory following a single great naval clash had long since passed. His strategy now was simply to make the American counter-offensive in the South Pacific as expensive as possible. Even so, he was willing to commit his naval forces one more time in an effort to retake Guadalcanal. The result was the battle of Santa Cruz.

**THE BATTLE  
OF SANTA  
CRUZ: 25-27  
OCTOBER  
1942**

Yamamoto divided his forces just as he had before, but this time he placed his non-carrier forces in the lead. His carrier force was kept behind, where they could launch strikes with relative impunity. He hoped that the American carriers would expend their energy attacking his leading ships and open themselves to a “Midway-type” riposte.

The plan was reminiscent of one Yamamoto had used earlier during the battle of the Eastern Solomons. While the carriers dueled, his transport ships and destroyers would sneak into Iron Bottom Sound and land reinforcements on Guadalcanal. Henderson Field would be put out of commission by naval bombardment and then captured in a land battle. Once the field was in Japanese hands, aircraft from Rabaul would be rushed to Henderson. The key to making this plan work was keeping the American carriers at bay.

### ***JAPANESE ORDER OF BATTLE***

Combined Fleet (Yamamoto)

Third Fleet, Carrier Strike Force (Nagumo)

(2) Aircraft Carriers: *Shokaku*, *Zuikaku* (with 45 VF, 47 VB, 41 VT)

(1) Light Carrier: *Zuiho* (with 18 VF, 6 VT)

(1) Heavy Cruiser: *Kumano*

(8) Destroyers: *Amatsukaze*, *Arashi*, *Hatsukaze*, *Maikaze*, *Teruzuki*,  
*Tokitsukaze*, *Yamakaze*, *Yukikaze*

Second Fleet, Advance Force (Kondo)

(4) Heavy Cruisers: *Atago*, *Maya*, *Myoko*, *Takao*

(1) Light Cruiser: *Isuzu*

(6) Destroyers: *Kawakaze*, *Makinami*, *Naganami*, *Suzukaze*, *Takanami*,  
*Umikaze*

Second Fleet, Close Support Force (Kurita)

(2) Battleships: *Haruna*, *Kongo*

(6) Destroyers: *Harusame*, *Kagero*, *Murasame*, *Oyashiro*, *Samidare*, *Yudachi*

Second Fleet, Vanguard Force (Abe)

(2) Battleships: *Hiei*, *Kirishima*

(3) Heavy Cruisers: *Chikuma*, *Suzuya*, *Tone*

(1) Light Cruiser: *Nagara*

(8) Destroyers: *Akigumo*, *Isokaze*, *Kazagumo*, *Makigumo*, *Tanikaze*, *Teruzuki*,  
*Urakaze*, *Yugumo*

Second Fleet, Air Group Force (Kakuta)

(1) Light Carrier: *Junyo* (with 24 VF, 21 VB, 10 VT)

(2) Destroyers: *Hayashio*, *Kuroshio*

Support Train

(1) Destroyer: *Nowaki*

## UNITED STATES ORDER OF BATTLE

South Pacific Force (Halsey)

Task Force 16 (Kinkaid)

- (1) Aircraft Carrier: *Enterprise* (with 34 VF, 36 VB, 12 VT)
- (1) Battleship: *South Dakota*
- (1) Heavy Cruiser: *Portland*
- (1) Light Cruiser: *San Juan*
- (8) Destroyers: *Cushing, Conyngham, Mahan, Maury, Preston, Porter, Shaw, Smith*

Task Force 17 (Murray)

- (1) Aircraft Carrier: *Hornet* (with 36 VF, 36 VB, 15 VT)
- (2) Heavy Cruisers: *Northampton, Pensacola*
- (2) Light Cruisers: *Juneau, San Diego*
- (5) Destroyers: *Anderson, Borton, Hughes, Morris, Mustin, Russell*

On October 25th, Rear Admiral Thomas Kinkaid (who had replaced Fletcher as commander of the U.S. carrier forces) sent the *Enterprise* and *Hornet* north from Espiritu Santo in order to intercept the Japanese carriers near the Santa Cruz Islands.

A Catalina PBY sighted Nagumo's Carrier Strike Force, but by the time Kinkaid received the report and launched a strike, the Japanese had steamed out of range. Near dawn the next day, Kinkaid renewed the search. This time, he sent out Dauntless bombers as search planes. He was determined not to waste time waiting for sighting reports from the PBYs. This bold approach paid off less than two hours later when a pair of the dive bombers spotted the Japanese carriers. Japanese fighters attacked them before they could get close, but the Dauntlesses escaped into the thick cloud cover.

Another pair of dive bombers overheard the sighting report and left their search vector to attack the carriers. They arrived over the Japanese ships while the fighters were chasing the first two bombers. This second pair managed to score a direct hit on the *Zuiho*, leaving a large crater in the carrier's deck. The stricken *Zuiho* was immediately ordered to return to the Japanese naval base at Truk to begin repairs. Admiral Kinkaid's scouting tactic had succeeded in removing one enemy carrier in record time.

Unfortunately for the Americans, a Japanese scout had spotted the *Hornet* just prior to this attack. The *Zuiho* managed to launch its aircraft before being damaged. These aircraft, plus those from the *Shokaku*, *Zuikaku*, and *Junyo* added up to a total of 135 planes on their way to the *Hornet*.

By the time this massive airstrike found Task Force 61, a storm had obscured the *Enterprise*, leaving only the *Hornet* visible. Since Nagumo believed that only one American carrier was present, that fact that his pilots



*IJN destroyer hit by American bombers*

**THE BATTLE  
OF THE  
PHILIPPINE  
SEA 19-21  
JUNE 1944**

only spotted the *Hornet* confirmed his belief.

For ten minutes, the *Hornet* took everything that the massive air strike could dish out. It was hit twice by torpedoes, leaving it dead in the water. Four bombs also hit the carrier, but the most damaging blow came from a Japanese pilot who deliberately crashed his crippled aircraft into the ship. The *Hornet* lay wrecked and abandoned. Although Japanese strikes continued to pound the ship for several more hours, the *Hornet* did not finally sink until the next day.

When a break in the clouds revealed the *Enterprise*, many of the attacking planes changed targets. Fortunately for the "Big E", all of the torpedoes fired at the carrier missed. Two bombs, however, hit the forward flight deck causing the ship to have difficulties conducting air operations. The *Enterprise* sent its aircraft to Espiritu Santo and left the battle.

Both American carriers were out of the way at a cost of only twenty-five aircraft. Yamamoto's plan was on the verge of success. The Japanese were now free to deal with Henderson Field and the Marines on Guadalcanal. Only one final hurdle remained. The American carriers had launched a strike of their own.

The American strike was not only weaker than the Japanese attack, it was uncoordinated and due to arrive piecemeal over the Japanese carriers. Even so, eleven of the *Hornet's* Dauntless dive bombers found the *Shokaku* and scored 4 hits. The rest of the American planes failed to find the Japanese carriers and went on to other targets.

Now that the *Shokaku* and *Zuiho* were stricken, Nagumo had only the *Zuikaku* and *Junyo* to continue the attack. Far more costly, however, was the loss of over 100 Japanese planes so far in this campaign. Japan could ill afford this drain of experienced pilots and front-line aircraft. Production simply could not meet the increasing demand.

For this reason, Yamamoto decided to withdraw his carrier force along with their few remaining pilots. Had he pressed the attack, there's a real possibility that the *Enterprise* would have been sunk, removing the last operational American carrier from the Pacific. As it was, Japanese pilots had done more than should have been expected. They had sunk one carrier and forced the withdrawal of another. In doing so, they made it possible for thousands of troops and tons of supplies to disembark on Guadalcanal.

The battle of Santa Cruz was a clear tactical victory for the Japanese, their first carrier vs. carrier win. It was a Pyrrhic victory, however, in light of the increasing American material superiority. The losses suffered in trained pilots and aircraft would ultimately affect the course of war.

At Santa Cruz, the United States came very close to losing both Guadalcanal and its only aircraft carriers in the Pacific. Although reinforcements would soon make their way to the South Pacific, for the moment the Marines on Guadalcanal were at the mercy of the Japanese. Fortunately, the Japanese were equally exhausted.

The 1942 time frame was deliberately chosen by the designers of this simulation because at that time in the Pacific war, both sides were still evenly matched. In fact,

if one was to be honest, the Japanese held a slight qualitative advantage. Their aircraft, especially fighters, were technically superior to those in the U.S. inventory.

It could also be argued that, man for man, Japanese pilots were better trained than their American counterparts. After all, Japan had been at war with China for years. All this practical experience gave them many more hours in the cockpit than the average pilot trainee in the U.S.

By 1944, the preponderance of American naval and air strength made an ultimate Japanese victory in the war highly unlikely. The two big advantages the Japanese held in 1942 – better pilots and better aircraft – were gone. The pool of trained Japanese pilots, which had never been very large to begin with, had been expended at Midway and Santa Cruz. The Zero, which had been such a factor in the early years, had been surpassed by the latest generation of U.S. fighters, like the new F4u Corsair and the Hellcat.

This scenario has been included despite the fact that it occurs two years after the others. The air engagement which took place during this battle was the largest of the entire war. For eight straight hours, Japanese and American aircraft were locked in a contest for control of the sky. This being the case, no flight game on the Pacific air war would be considered complete without simulating this battle.

For all you players who, as American pilots, are tired of getting pushed around by Zeros, this scenario allows you to fly the Corsair and do some pushing of your own. For those of you who like a challenge, this scenario allows you to pit your outnumbered, but trusty, old Zero against the best the Americans can throw at you.

In June of 1944, the Japanese faced American advances on two fronts. MacArthur's forces were preparing to invade the Philippines, and in the Central Pacific, Nimitz's forces were moving on the Marianas Islands. Admiral Soemu Toyoda, who would be the last CinC of the Japanese Combined Fleet, argued against taking up a strictly defensive stance. He sought to bring about the decisive battle as Yamamoto had tried to do for several years.

When the U.S. invaded Saipan, one of the Marianas Islands, Toyoda's hand was forced. If Saipan fell, enemy long-range bombers based on Saipan would be able to launch raids against the Japanese home islands. This was a threat that Toyoda could not ignore. In this respect, the invasion of Saipan was a "Midway in reverse." The United States Navy had lured the Japanese out to fight by attacking an island strategically important to their defense line.

The Japanese plan of battle, code named A-GO, required at least 500 land-based aircraft, primarily because of the superiority of the American aircraft carriers. Vice-Admiral Jisaburo Ozawa was to command the First Mobile Fleet in the Marianas. His strategy was to soften up the American naval forces by first attacking with land-based air strikes from Guam, Tinian, Saipan, and Yap. Ozawa's carriers would then move in and finish off the survivors while remaining out of range of American aircraft.

In the eighteen months since the big carrier battles in 1942, the Japanese navy had done its best to rebuild and recover. Many new aircraft-carrying ships were either purpose-built or converted from other hulls. The shortage of trained pilots was still haunting their war effort, however. Losses continued to outpace production. For this battle, Ozawa scrapped together every last pilot he could find. All told, the Japanese carrier force could launch over 400 aircraft, though many would be flown by only partially trained pilots.

### ***JAPANESE ORDER OF BATTLE***

#### **Mobile Force, Vanguard (Ozawa)**

(3) Light Carriers: *Chitose, Chiyoda, Zuiho* (with 62 VF, 9 VB, 17 VT)

(4) Battleships: *Haruna, Kongo, Musashi, Yamato*

(7) Heavy Cruisers: *Atago, Chikuma, Chokai, Kumano, Maya, Takao, Tone*

(1) Light Cruiser: *Noshiro*

(7) Destroyers: *Asashimo, Fujinami, Hamakaze, Kishinami, Okinami, Shimakaze, Tamanami*

#### **"A" Force**

(3) Heavy Carriers: *Shokaku, Taiho, Zuikaku* (with 79 VF, 77 VB, 51 VT)

(2) Heavy Cruisers: *Haguro, Myoko*

(1) Light Cruiser: *Yahagi*

(7) Destroyers: *Akizuki, Asagumo, Isokaze, Hatsuyuki, Shimotsuki, Urakaze,*

## *Wakatsuki*

### "B" Force (Joshima)

- (2) Converted Carriers: *Hiyo, Junyo* (with 81 VF, 36 VB, 18 VT)
- (1) Light Carrier: *Ryuho*
- (1) Battleship: *Nagato*
- (1) Heavy Cruiser: *Mogami*
- (8) Destroyers: *Akishimo, Hayashio, Hamakaze, Michishio, Nowaki, Samidare, Shigure, Yamagumo*

### 1st Supply Force

- (4) Destroyers: *Hatsushimo, Hibiki, Tsuga, Yunagi*
- (4) Fleet Oilers

### 2nd Supply Force

- (2) Destroyers: *Uzuki, Yukikaze*
- (2) Fleet Oilers

## **UNITED STATES ORDER OF BATTLE**

### Fifth Fleet (Spruance)

#### Task Force 58 (Mitscher)

##### Task Group 58.1 (Clark)

- (2) Aircraft Carriers: *Hornet, Yorktown* (with 85 VF, 77 VB, 35 VT)
- (2) Light Carriers: *Bataan, Belleau Wood* (with 50 VF, 19 VT)
- (3) Heavy Cruisers: *Baltimore, Boston, Canberra*
- (2) AA Light Cruisers: *Oakland, San Juan*
- (14) Destroyers: *Bell, Boyd, Bradford, Brown, Burns, Charrette, Conner, Cowell, Craven, Gridley, Helm, Izard, Maury, McCall*

##### Task Group 58.2 (Montgomery)

- (2) Aircraft Carriers: *Bunker Hill, Wasp* (with 79 VF, 35 VB, 36 VT)
- (2) Light Carriers: *Cabot, Monterey* (with 45 VF, 17 VT)
- (3) Light Cruisers: *Sante Fe, Mobile, Biloxi*
- (12) Destroyers: *Dewey, Hickox, Hull, Hunt, Lewis Hancock, Owen, Miller, Stephen Potter, The Sullivans, Tingley, Macdonough, Marshall*

##### Task Group 58.3 (Reeves)

- (2) Aircraft Carriers: *Enterprise, Lexington* (with 75 VF, 55 VB, 32 VT)
- (2) Light Carriers: *San Jacinto, Princeton* (with 48 VF, 17 VT)
- (4) Heavy Cruisers: *Indianapolis, Cleveland, Montpelier, Birmingham*
- (1) AA Light Cruiser: *Reno*
- (13) Destroyers: *Anthony, Braine, Bronson, Caperton, Cogswell, Cotten, Dortch, Gatling, Healy, Ingersoll, Knapp, Terry, Wadsworth*

#### Task Group 58.4 (Harrill)

- (1) Aircraft Carrier: *Essex* (with 42 VF, 36 VB, 20 VT)
- (2) Light Carriers: *Cowpens*, *Langley* (with 46 VF, 18 VT)
- (1) Heavy Cruiser: *Vincennes*
- (1) AA Light Cruiser: *San Diego*

(2) Light Cruisers: *Houston*, *Miami*

(14) Destroyers: *Ausburne*, *Case*, *Converse*, *Dyson*, *Ellet*, *Lang*, *Lansdowne*, *Lardner*, *McCalla*, *Spence*, *Stanly*, *Sterret*, *Thatcher*, *Wilson*

#### Task Group 58.7 (Lee)

##### Battleline

(7) Battleships: *Alabama*, *Indiana*, *Iowa*, *New Jersey*, *North Carolina*, *South Dakota*, *Washington*

(4) Heavy Cruisers: *Minneapolis*, *New Orleans*, *San Francisco*, *Wichita*

(14) Destroyers: *Bagley*, *Bennett*, *Conyngham*, *Fullam*, *Halford*, *Hudson*, *Monssen*, *Mugford*, *Patterson*, *Quest*, *Selfridge*, *Stockham*, *Twinning*, *Yarnall*

#### COMPARISON OF AVAILABLE AIRCRAFT

	Fighters	Dive Bomb
Torp Bomb	Total	
Japan	222	113
95	430	
United States	232	184
475		891



*IJN transports and cruiser under attack by U.S. bombers*

Lying in wait for the Japanese response was the U.S. Fifth Fleet's massive Task Force 58, commanded by Vice-Admiral Marc Mitscher. Mitscher's four task groups numbered seven heavy carriers, including some of the new *Essex* class (the *Bunker Hill*, *Enterprise*, *Essex*, *Hornet*, and the new *Wasp*, *Yorktown*, and *Lexington*) and eight light carriers (*Belleau Wood*, *Bataan*, *Monterey*, *Cabot*, *San Jacinto*, *Princeton*, *Langley*, and *Cowpens*). Taken together, these ships could launch almost 900 aircraft.

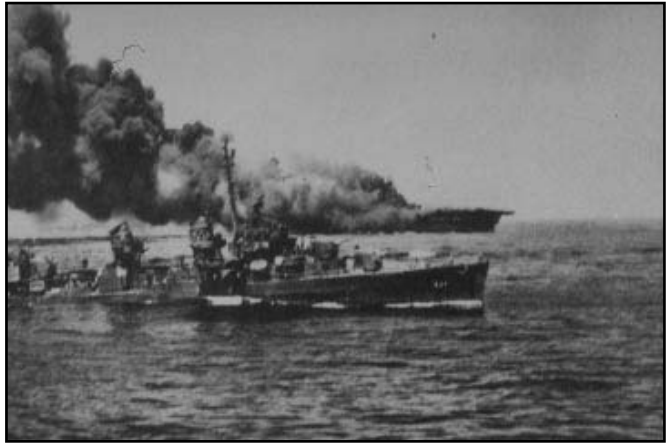
The Japanese plan to utilize land-based aircraft was stillborn. Between June 15th and 19th, Task Force 58 raided the Japanese airbases on Iwo Jima, Chichi Jima, Guam, and Rota. On Guam and Rota, the airfields were rendered completely useless, so rather than the 500 land-based aircraft needed for A-GO, the Japanese were left with only 50.

The plan had assumed that land-based aircraft would destroy at least a third of the



American carrier fleet before Ozawa's Mobile Force arrived. Now, Ozawa would have to face the full complement of the Fifth Fleet's carriers. Despite the fact that American carrier aircraft dominated the skies over the Marianas, the plan went forward.

As the Japanese fleet left the Philippines to challenge the U.S. Fifth Fleet, American subs found it and reported its general position. Adm. Spruance knew that the Japanese were mounting a major operation against him, so he decided to hold his forces to the west of Guam. Although submarines had located the on-coming Japanese ships, scout planes from the American carriers failed to find them. Japanese scout planes, however, found the American carriers.



*The Bunker Hill, screened by destroyers, after a kamikaze attack*

Ozawa launched his first airstrike, unaware that the 500 plane land-based force had been decimated. As this strike proceeded toward Task Force 58, planes from the American carriers were attacking Guam. Unfortunately for Ozawa, his airstrike was detected on radar, a relatively new invention. This gave Spruance time to recall his attacking aircraft. Spruance also positioned a picket line of battleships, cruisers, and destroyers that the Japanese planes would have to cross in order to get to the U.S. carriers. Fighters and anti-aircraft fire from these ships knocked down 42 out of the 69 planes. Not a single aircraft reached the American carriers.

The second Japanese strike of the morning ran into the same resistance as its predecessor. Only 20 planes made it past the picket defense line, and none scored any hits. Only two aircraft from the strikes made their way to Guam. The planned attack on the U.S. carriers, which was supposed to take place after they had rearmed on Guam, clearly would not take place.

Throughout the battle, Ozawa remained in the dark about the losses suffered by his strike groups. Vice-Admiral Kakuji Kakuta, commander of the land-based air contingent, was feeding Ozawa false reports. He assured Ozawa that his aircraft had inflicted heavy damage on the American task force. Ozawa therefore ordered a third strike. This wave of 47 planes avoided the picket line of anti-aircraft ships but got lost in the process and was forced to return.

A fourth strike was ordered, 82 planes in all, but these aircraft fared no better. Of these, 33 planes found the southernmost of the American task groups (58.2) and were all shot down for their trouble. The others failed to find the American carriers and headed for Guam. Thirty of these were shot down before they reached the island, leaving the final 19 Japanese planes to discover that American bombers had destroyed the airfield at which they were supposed to land.

Just after noon, the U.S. submarine *Cavalla* hit the fleet carrier *Shokaku* with three torpedoes. Several hours later, the “Sho” rolled over and sank. Twenty minutes later, the *Taijo* also received a torpedo hit from the submarine *Albacore* and suddenly blew up. In both cases, ignition of the fumes from the unrefined fuel oil was the major factor in the demise of the carrier. Mitscher had not yet launched a single air strike against the Japanese carriers, yet Ozawa had already lost two of his fleet carriers.

Ozawa remained unaware of the true situation. Though he in fact had barely 100 planes still airworthy, he continued to believe that the day was his. Kakuta reported that many Japanese planes were safely on Guam and that reinforcements were on the way. These false reports, coupled with other incorrect ones stating that four American carriers had been sunk, convinced Ozawa to regroup his forces and continue the attack the next day. In reality, his forces had already suffered a decisive defeat. The Americans had lost only 29 planes, while they had destroyed a total of 346 Japanese aircraft.

Late in the afternoon of the next day, June 20, Spruance’s search planes finally located Ozawa’s Mobile Force. Mitscher ordered a full airstrike of 216 planes, even though it was already late in the day. The returning American aircraft would be forced to attempt difficult night landings. Over half of the U.S. planes, 130 aircraft in all, were lost, but the damage to the Japanese fleet was absolutely devastating.

Because of the famous “dusk raid”, the light carrier *Hiyō* was sunk; the light carriers *Junyō* and *Chiyoda* were heavily damaged. The fleet carrier *Zuikaku*, last of the Pearl Harbor raiders, continued to lead a charmed existence. Although damaged, it remained afloat.

More than half of the remaining Japanese aircraft were destroyed, leaving only 35 planes in Ozawa’s entire fleet. The battle of the Philippine Sea would forever be known among American pilots as the “Great Marianas Turkey Shoot”. The long sought-after great naval battle of the war had finally occurred. Unfortunately for the Japanese, it had come two years too late. By 1944, the industrial might of the United States had built a carrier force many times that of Japan’s.