DOWNLOAD PDF HISTORY OF DIVE BOMBING, THE

Chapter 1 : Wiki: Dive bomber - upcScavenger

This is the incredible history of the dive bomber told from both official records and eyewitness accounts. It tears away the many myths and misrepresentations that surrounded this type of warplane and presents a truly original and detailed history, from the first true combat dive bombing by an RAF.

Edit It is difficult to establish how dive bombing came into being. The Royal Flying Corps on the Western Front found its biplane two seat bombers insufficiently accurate. Some recorded altitude at the top and bottom of their dive in log books and squadron records, but not the steepness of the dive. It was certainly not near vertical, as these early aircraft could not withstand the stresses of a sustained vertical dive. The angle of dive in these attacks was again not recorded. Whether it should be considered in more modern parlance as a fighter-bomber or a dive bomber again depends upon the definition of dive. It had armoured protection for the pilot and fuel system to attack at low level but lacked dive brakes for a vertical dive. The war ended before it could see action. So not until did the Air Ministry issue specifications for both land-based and carrier-based dive bombers. It had dive brakes which doubled as flaps for carrier landings. The American and Japanese navies and the Luftwaffe chose vertical dive bombers whose slow speed had dire consequences when they encountered modern fighters. The Royal Naval Air Service developed dive bombing as a tactic against Zeppelin hangars and formed and trained a squadron at Manchester for this task. As Zeppelins were tethered close to stores of hydrogen, results were spectacular. The cost in pilots was very high, with casualties on some days reaching 30 per cent. Based on the Sopwith Snipe it had pounds kilograms of armour in the front end to protect the pilot and fuel against ground fire. A total of were ordered but only two were delivered to France before the Armistice. Production ceased at just aircraft. Fuller published findings which were later taken up by Heinz Guderian to form the basis for Blitzkrieg tactics of using dive bombers with tanks employed by the Germans in He was awarded the Military Cross for this and other exploits. But the heavy casualties to unprotected pilots cast a heavy pall on the exploits and influenced RAF thinking for 20 years. It ran a series of tests at the Armament Experimental station at Orfordness in Suffolk. In principle, it obviated the need for a vertical dive. But they were not considered good enough to justify the expected casualties. The Royal Air Force which took over both army and naval aviation in April , retired its Sopwith Salamander dive bombers at the end of the war. The later Salmson 4 was to be a ground attack and dive bomber, but production was cancelled at the end of the war. Mitchell became a strong advocate of dive bombers after witnessing British and French aerial attacks. Both naval staffs opposed the view taken by the respective airmen. During Sanderson familiarized aviators of USMC units at the Atlantic coast with dive bombing techniques [18] Dive bombing was also used during the United States occupation of Nicaragua. The Imperial Japanese Navy ordered the Heinkel He 50 in as a floatplane and carrier-based dive bomber and embarked some on new carriers from in a developed form as the Heinkel He 66 , from which the Aichi D1A was further developed in Japan. The Luftwaffe confiscated a Chinese export shipment and ordered more. Targets were often likely to be a small or fast-moving and the need for accuracy made dive bombers essential. Udet, then a stunt pilot, flew one in aerobatic displays during the Berlin Olympic Games. Due to his connections and Nazi party , he became development director of the Ministry of Aviation Nazi Germany where he pushed for dive bomber development. Against small targets, a single-engine dive bomber could achieve four times the accuracy at one tenth of the cost of a four engine heavy bomber, such as the projected Ural bomber. Soon the Luftwaffe issued a contract for its own dive bomber design, resulting in the Junkers K 47 , which following extensive trials would in turn result in the gull-winged Junkers Ju 87 Stuka a contraction of Sturzkampfflugzeug, literally "diving combat airplane". Several problems, such as the tendency of the fixed undercarriage to sink into soft ground and an inability to take-off with a full bomb load appeared. Condor Legion experience in Spain demonstrated the value of dive bombers especially on morale of troops or civilians unprotected by air cover. He also insisted against the advice of Ernst Heinkel that the Heinkel He bomber, ordered in November , be able to dive bomb. Lack of a sufficiently powerful, reliable powerplant fatally compromised its utility and it never performed in the dive bomb role and the requirement was eventually dropped. Royal Navy procedures

required a navigator when operating over open ocean to find the carrier in case the carrier had moved in bad weather. The Skua was intended to intercept attacks by unescorted long-range bombers. Just were built and it was relegated to target towing. Five airframes left behind in Halifax later reached the RAF, who quickly relegated them to the status of ground instructional airframes for the training of mechainics. It was to prove a potent weapon against surface ships. The writings of Colonel J. Fuller a staff officer and Basil Liddell-Hart a military journalist propounded the concept of mobile tank forces supported by ground-attack aircraft creating a breakthrough. These were eagerly studied by Heinz Guderian who created the combination of Panzers and Junkers Ju 87s which proved so potent in Poland and France. The Stuka could be used as aerial artillery moving far ahead of the main forces with Panzers to smash enemy strong points without waiting for the horse-drawn artillery to catch up. It was central to the concept of Blitzkrieg which required close co-ordination between aircraft and tanks by radio. Both were level bombers with similar bomb-loads and entered service in Many were also supplied to the Soviet Air Force, which also used the Ilyushin Il-2 Sturmovik ground-attack aircraft in huge numbers. None of these were dive bombers.

Chapter 2 : Pearl Harbor - HISTORY

THE HISTORY OF DIVE-BOMBING benefits from the inclusion of many first-person accounts of missions by various dive-bomber vets such as Paul Holmberg, Dennis Young, Helmut Mahlke and Antonio Cumbat as well as after-action unit reports and accounts by dive-bomber victims, etc. Interwoven into that story is the illuminating tale of British air.

Otsego, Michigan I have pieced a few of my posts together into one post, so there may be some repeat information. There are members who do not know what a Dive Bomb is or how to fish them. I will explain what they are, give a little history about them, explain how to run them, share "my" test data, and explain how to run multiple dive bombs on the same side. I also created a video that shows how to run them. What is a Dive Bomb? A dive bomb is an add on planing weight system. They are attached to your line and can be added to braided, copper, lead core, or mono lines. They have a tapered soft plastic plug that slides in from the rear and holds your line in place. They are currently available in 4 sizes, 1oz, 2oz, 3oz, and 4oz. Anglers with a limited amount of rods will benefit the most from them. The original dive bomb was all lead, including the fin. The area where the plug was inserted had a tendancy to open up after multiple uses. This opening could be closed back up by putting it against a solid surface and applying pressure to it. Michigan Stinger redesigned the Dive Bomb in They still have the same amount of lead as the original ones, but now they have a stainless steel fin. The extra lead was added to the planing surface, and makes the bill wider. All of the stainless fins are tumbled in a medium for 30 minutes before they are put into a casting. This keeps the fish away from the back of the boat when you are removing the Dive Bomb. Imagine having a fish go ballistic at the back of the boat while you are removing the Dive Bomb. Run out your desired amount of line, pull the tapered plug from the back of the Dive Bomb, lay your line in the opening, and slide the plug back in from the back. Let out the rest of your line to achieve your desired depth, and attach to your board, or put it in a rod holder. Dive Bomb Instructional Video Depths Achieved I spent 3 hours this spring pulling these in the shallows off Muskegon, trying to come up with some sort of dive curve. The speeds listed are GPS speeds. I did not take into account underwater currents. This could cause the depths to be off slightly. The bottom in the shallows at Muskegon is very inconsistant and was hard to find a level stretch. The only "true" way to get the depths is with a scuba diver in the water. The next precission trollers guide is "suppose" to have the dive curves for the dive bombs. In the shallower water, the bottom is very inconsistant. The slowest I could get my boat down to was 1. The only way to come up with an accurate dive curve, is with a diver in the water. This also depends on how much line you have out. In order to hit max depths with the dive bombs, you need to have lots of line out. Before we get into running multiple dive bombs on the same side of a boat, we need to understand how to run multiple in-line planer boards on the same side of a boat. When running multiple in-line boards on the same side of a boat, the deepest bait is usually the first board closest to the boat from the boat. It is referred to as the inside board. This usually has the most line out. After the inside board, you want to run your next deepest bait. This is usually attached to the middle board, or outside board if you are only running 2 lines per side. This usually has the second longest out. The shallowest bait, with least amount of line out, is attached to the outside board furthest from the boat. Dive Bombs were introduced in , and I quickly got my hands on them. It was recommended in the beginning to attach the dive bomb in the middle of whatever core you were running. If you were running a full core, you would attach the dive bomb at the end of the 5th color. I soon discovered how easy it was to get tangled. It seemed like I always tangled when I would try to run my middle board with dive bombs attached, behind the inside board to work it into position. After a couple of tangles, I gave up on the idea of running multiple dive bombs on the same side. Why was I getting tangles when I tried to run boards around the inside board and work them into position? I believe there was a couple of things causing the issue. The fact that the dive bomb was probably diving deeper because it was being let out slower speed equals more depth , and the dive bomb being closer to the board on the new line being let out its on the 3rd color of a half core, and after the 5th color of a full core. Less line out and more depth equals tangles. Can multiple inline planer boards with dive bombs be ran on the same side? If you would have asked me this at the end of last season, or the beginning of this season, I would have said no. Now that I have more time on the water

running them and a better understanding of the depths they achieve, I have to say "you bet they can". I spent a few hours on the water this spring, conducting depth testing for the different size dive bombs. I have been successfully running them with 3 inline planer boards and dive bombs on each one, on the same side without tangles. One of the keys for me to successfully run multiple dive bombs was to have the dive bombs the same distance from the boards. Also, turn the clicker on on your reel after you attach the in-line board. This slows it down from going back to fast and causing the dive bombs to get extra depth. We all know what can happen when a fish is behind the boat and not ready to be netted. For those that dont, the fish can go ballistic! When this happens, you can not control the fish. You get greater depth out of a dive bomb, the further it is attached from the board. Remember to keep the dive bombs the same distance from the boards. I am running church walleye boards with adjustable weights. With the full core and a 4oz dive bomb, I have the weight adjusted all the way foreward to 2. With the 2 color and the 2oz dive bomb, I have the weight adjusted foreward to 1. Running them this way keeps them lined up pretty good. I also marked my boards with numbers for easy identification when grabbing for boards. More baits in the strike zone equals more fish in your box!

Chapter 3 : Douglas SBD Dauntless - Wikipedia

This is the incredible history of the dive bomber told from both official records and eyewitness accounts. It tears away the many myths and misrepresentations that surrounded this type of warplane and presents a truly original and detailed history, from t.

Maybe you can write up something about mast-level bombing? The British and Germans utilized night time bombing missions so visual bomb sights were not as useful to them. They both opted for radio beam technology which both guided their bombers to the target and informed them when to drop their payloads. The Germans used this technology from the beginning of the war in 39, the British while always flying night time missions converted to their own brand of beaming technology later in the war. The United States philosophy was to defend their bombers in the air, and fly daylight missions which they felt were more accurate and reliable in hitting the target. The United States tried different strategies to defend their bombers in daylight before settling on long range fighter escorts with extra large drop tanks. The problem everyone was trying to counter was Bombers were slow vulnerable cumbersome beasts, vulnerable to fighter intercepters. This vulnerability was negated by night time bombing. Even large slow moving bombers could fly safely across Europe or the UK with a coat of dark paint and a sufficiently high altitude. Problem was such high flying nighttime missions while safer for the bombers were not very accurate at hitting targets smaller than cities, and even cities proved difficult when they were blacked out. Which meant nighttime bombing without electronic aids was largely a terror weapon, not a strategic weapon. Germans To negate this shortcoming, the Germans used sophisticated radio beaming technology. First the Germans used a system called Knickebein. One beam would determine the path of the bombers. An intercepting beam would tell the bombers when to drop their bombs. The British code named the German knickebein system "head-ache" and their countermeasures were code named "aspirin". The British struggle to identify and counter this German system was known as the " Battle of the Beams ". The knickenbein system had a number of short comings. The beam was relatively easy for the British to identify once they started looking, and the system was not designed to direct large formations. More focus also meant more accuracy. In addition, the bombers carried a radar mapping device, code-named H2S, that displayed reasonably detailed pictures of coastal cities such as Hamburg, where a clear contrast between land and water allowed navigators to find the target areas. United States The United States was not a fan of night time bombing. While safer for the bombers, prior to the development of allied beaming technology night time bombing compromised the accuracy and effectiveness of the missions. This device was named the Norden Bombsight. The Norden bombsight was pretty accurate in ideal conditions, but was subject to problems from rain, fog, or cloud cover all of which could be sufficient to scrub entire missions. The Norden Bombsight was also notoriously complex and difficult to use. An additional benefit of American daylight missions was that the allies could conduct missions 24 hours a day, with the RAF conducting night time raids. Both nuclear devices dropped on Japan were dropped utilizing the Norden Bombsight. To counter the vulnerability problems of bombers the Americans first tried to fortify its bombers. The theory was fortified bombers in tight formations would be able to defend themselves from enemy fighters. Fortifying the bombers though made them heavier and slower; ultimately this tactic was not effective in countering the dangers of enemy fighters.

Chapter 4 : The History of Dive Bombing

A dive bomber is a bomber aircraft that dives directly at its targets in order to provide greater accuracy for the bomb it drops. Diving towards the target simplifies the bomb's trajectory and allows the pilot to keep visual contact throughout the bomb run.

However the same structure used on Hawker Hurricanes proved surprisingly strong and stood up to hits from German 20mm Cannon shells better than the monocoque fuselage of the Spitfire, and was much easier to repair. Origins The Hawker Henley is one of the most intriguing "what-ifs" in the history of aviation, yet this is not an aircraft that existed as only a paper exercise, or a partly built prototype, or even a flying prototype that was cancelled. No, this was an aircraft that actually went into production with examples built. This was an aircraft that pilots loved to fly, had an outstanding performance and was both rugged and reliable. So what went wrong? To try to answer this question you need first to understand the fundamental difference between British air strategy at the start of the Second World War and that of the German Luftwaffe. The important word here is strategic. All other uses of air power for tactical purposes were secondary. As far as support for the British Army was concerned it was only felt necessary to provide artillery observation aircraft the Westland Lysander and the bare minimum of fighters a few squadrons of Hawker Hurricanes to try to shoot down the opposing artillery observation aircraft. Why bomb individual targets in the front line and when you could destroy the factories that made the tanks, guns and ammunition? The Germans had exactly the opposite view, the front line at the point of attack the Germans have a word for it, the "schwerpunkt" was the central focus for air power, with Ju87 Stukas operating in direct support of the army while medium bombers hammered the railways and roads behind the lines to prevent the enemy concentrating to resist the attack. It was this specification that gave rise to the Hawker Henley. Was there really such a fundamental change of policy? It should be stressed that these bombers were never expected to operate in direct support of the army in a European war, if they lacked the range to reach the enemys centres of production they were expected to hit the railway networks bringing supplies to the front line, preferably hitting nodal points, marshalling yards and stations as far back from the front line as possible these were the favoured targets for RAF two-seat bombers in the last year of WWI. The fact that it included a requirement to dive-bomb is the misleading bit, the RAF seems to have never been seriously interested in true dive-bombing at high angles, it never invested money in research and never developed true dive-bombing sights unlike the Germans who had fully automatic bomb sights that would even pull the aircraft out of its dive. The lack of dive-brakes and bomb-crutches in the Henley design show that true dive-bombing was never a serious consideration. However, it was stressed for pull-outs from dive-bombing at fairly high angles up to 70 degrees and with proper training this could have greatly improved the accuracy of bombing - maybe even doubling or trebling the number of direct hits on target. It is this aspect of dive-bombing, as a "force multiplier" that is often overlooked. The Prototype Hawker Henley K in side-view. Notice that unlike the Hurricane the Henley had a retracting tail-wheel. The semi -conical fenestration at the rear of the gunners position could be rotated down into the fuselage in order to use a rear-mounted gun. The Henley was almost certainly rejected as a bomber because of the existence of the Fairey Battle. In the early s there was a real chance that the international disarmament conference would put a limit on the weight and size of bombers. The Battle was designed to meet the likely limits of such a treaty, so that the RAF would still have a bomber force if the new Wellington, Whitley and Hampden designs were outlawed. The Battle, with its 3 crewmen, was a big aircraft, go and stand next to the one at the RAF museum in Hendon and you will be amazed just how large it is. I remember as a lad building an Airfix kit of the Battle, putting it down next to my models of Spitfires and Hurricanes and wondering if Airfix had got the scale wrong! It certainly was not. In fact it was the Hawker Henley that could more properly said to be an enlarged fighter - being based on the Hawker Hurricane , sharing the same outer wing design and undercarriage. In construction the Battle, although designed a couple of years before the Henley was much more advanced, being a full stressed-skin design with a monocoque fuselage Fairey had benefited from close contacts with US aircraft manufacturers who had perfected stressed-skin construction , while the Henley, like the Hurricane, still

used a metal latticework covered with wooden frames and fabric to provide a streamlined fuselage. You can imagine the Air Ministry big-wigs, having just signed up to massive orders of Fairey Battles looking at the Hawker Henley and wondering "Do we really need that as well? It is important to stress again that the Battle squadrons were never meant to operate in support of the Army. Their task was to bomb factories , oil storage and strategic communication hubs in the Ruhr region of Germany. The Battles were never used in the strategic role planned for them. This was because the French, fearful of German reprisals, forbade their use against German targets. When the German Blitzkrieg began the Battle crews found themselves flung against German armoured columns and river crossings, targets they had never trained for. The Battles suffered heavy casualties. Would the squadrons have faired better if they had used Hawker Henleys rather than Fairey Battles? The underside of the Hawker Henley, showing the bomb-bay which could accommodate two Ib bombs. Having rejected the Henley as a bomber the surprising thing is that it was still ordered into production, but as a target tug. Now the RAF did have an urgent need for a fast target tower; the old biplanes they were using in the role simply did not give a realistic speed for practice by the new generation of fighters, Spitfires and Hurricanes. But it still seems strange use for an aircraft type that was probably the fastest twin-seat bombing design then flying. A production line was established at Hucclecote near Gloucester run by the Gloster aircraft company, then already part of the larger Hawker group, and Henleys were produced. The drogue for towing was wound back by a windmill arrangement that protruded from the side of the fuselage. As a target tower the Henley had shortcomings - it was a bit like using a sports car to tow a caravan, the Merlin engine had to be run at high speed for long periods and so they wore out much more quickly than in normal use. The Henleys neatly faired coolant radiator was exactly the right size and efficiency for normal flying, but when towing a target at high engine speed but lower airspeed the lower flow of air through the radiator was insufficient to keep the engine cool and so overheating would occur. The Henley was not completely replaced until the web-link of Henley crashes at the bottom of the page shows continued activity through which contradicts the oft-repeated line that the Henley was retired in Henley K, the second prototype, in factory-fresh silver finish, showing the windmill arrangement projecting from the port side of the aircraft. This was used to wind back target drogues. Note the pull-down step to aid stepping up onto the wing - added after testing of the first prototype at Martlesham Heath had shown that clambering onto the wing with a parachute was a tricky business. The real surprise in the Henley story is why it was not pressed into service during the emergency period of After the Battle squadrons had been torn to shreds over France and the evacuation from Dunkirk it seems incredible that the Henley was not seen as a stop-gap. All this while some Hawker Henleys were being used as target tugs or stored in maintenance units. The Bermuda was an unmitigated failure that cost the UK taxpayers millions of pounds the contracts were signed before lease-lend came into force and the U. The Vengeance did prove itself a good dive-bomber but only after considerable development problems were overcome. It seems incredible that the Henley was not utilised during this period. It would have needed armour protection for the crew added and self-sealing linings fitted to the fuel tanks to make it fit for combat, and these additions would have taken away something from the performance. But even with mph lopped off the top speed it would still have out-performed the Vengeance in all but bomb load, and even that might have been equalled with the more powerful Merlins available later in the war. The Henley performed valuable service as an engine test-bed, The prototype K was fitted with a Rolls Royce Vulture engine, as was L Henley L served as a test-bed for the Rolls Royce Griffon. Henley L was used for testing of the powerful Rolls Royce Griffon engine, used on late marks of the Spitfire, the Fairy Firefly and Lincoln bomber. Note the big chin radiator and the modified rear canopy for the technician s monitoring the engine test instrumentation. It still looks an elegent aeroplane. One can only guess at the performance of a production version of the Henley fitted with a Griffon or late model Merlin engine. One would expect it to be well above mph. Rather than the chin radiator of the Griffon installation it used a ventral "belly" radiator like the Hurricane, although in this view you are reminded strongly of the P Mustang. Of course the Hurricane then went on to be widely used as a fighter-bombers, often carrying bomb-loads equal to the Henley. After the Hurricane the factory then produced the Typhoon, the outstanding fighter-bomber backbone of the British Tactical air Forces in the allied invasion of Europe. As originally constructed it had one of the early trial Merlin "F" engines and fabric

covered outer wing sections like the early Hurricanes. It was later re-engined with a production Merlin I engine and given fully stressed-skin metal wings. The second Henley prototype K was completed as a target tug with a Merlin II engine and first flew on 26th May This testing did show up some problems with access and control. The most major problem seems to have been forward visibility through the curved front canopy used on the prototype, which was easily obsured by rain or oil. Most of these problems seem to have been cured on production aircraft. The top speed in level flight noted for this prototype was mph at 17, ft. Another production target-tug Henley was also tested late the same year and that was dived to mph and pulled out at 6. The Henley was a streamlined mid-wing monoplane, the mid-wing arrangement allowed the Henley to have a small bomb-bay that could accommodate two -lb bombs side-by-side. There was provision for the rear gunner to adopt a prone position to use a bomb-sight in the floor of the aircraft for level-bombing it seems to me from the cut-away drawings available that the "window" through which the bomb-sight operated was only uncovered when the bomb-bay doors were opened. While operating the bomb-sight the aircraft would be vulnerable from attack from behind while the gunner was out of reach of his gun. In the bomber version this rearward firing gun would have been a. The Henley was stressed for dive-bombing at angles up to 70 degrees, but there is no evidence of any arrangement for throwing the bombs in the bomb-bay clear of the propeller disk when dive bombing at high angles most dive-bombers used a bomb "crutch" to swing the bomb away from the fuselage on release. There was provision in the original bomber design for a single browning. He took off in a Henley target tug to intercept a Junkers Ju 88 fastest of the German twin engined bombers of the time that was flying over the Bristol channel. He closed on the Ju 88 and. Range miles Service Ceiling: This painting featured in Peter C. This is my attempt at a Hawker Henley in desert camouflage colours circa A mid war Henley could have benefited from the increased power of the later Merlin engines, giving increased performance. Hawker Henley painted as it might have appeared in Fleet Air Arm service early The Skuas were operating at the limit of their range. One certainly wonders why the Henley was not used in this role instead. Note the number of cases of engine failure, the concentration of Henley activity in Cornwall and South Wales and also the fact that the Henley continued to be used well into Clarke , Chapter 15 "Condemned at Birth! Published by Ian Allan

Chapter 5 : Dive bomber | Military Wiki | FANDOM powered by Wikia

A truly original and detailed factual history, from the first true combat dive- Bombing by a RFC pilot in , to the last stirring actions and covers dive- bombers of every nation that employed the type.

Visit Website Instead, the sanctions made the Japanese more determined to stand their ground. During months of negotiations between Tokyo and Washington , D. It seemed that war was all but inevitable. Where Is Pearl Harbor? Pearl Harbor, Hawaii , is located near the center of the Pacific Ocean, roughly 2, miles from the U. Therefore, no one believed that the Japanese would start a war with an attack on the distant islands of Hawaii. Additionally, American intelligence officials were confident that any Japanese attack would take place in one of the relatively nearby European colonies in the South Pacific: Because American military leaders were not expecting an attack so close to home, the naval facilities at Pearl Harbor were relatively undefended. Almost the entire Pacific Fleet was moored around Ford Island in the harbor, and hundreds of airplanes were squeezed onto adjacent airfields. To the Japanese, Pearl Harbor was an irresistibly easy target. Destroy the Pacific Fleet. On December 7, after months of planning and practice, the Japanese launched their attack. At about 8 a. Bombs and bullets rained onto the vessels moored below. The ship exploded and sank with more than 1, men trapped inside. Next, torpedoes pierced the shell of the battleship USS Oklahoma. With sailors aboard, the Oklahoma lost her balance, rolled onto her side and slipped underwater. Impact of the Pearl Harbor Attack In all, the Japanese attack on Pearl Harbor crippled or destroyed nearly 20 American ships and more than airplanes. Dry docks and airfields were likewise destroyed. Most important, 2, sailors, soldiers and civilians were killed and about 1, people were wounded. But the Japanese had failed to cripple the Pacific Fleet. By the s, battleships were no longer the most important naval vessel: Some had returned to the mainland and others were delivering planes to troops on Midway and Wake Islands. As a result, the U. Navy was able to rebound relatively quickly from the attack. Roosevelt addressed a joint session of the U. Congress on December 8, the day after the crushing attack on Pearl Harbor. I believe I interpret the will of the Congress and of the people when I assert that we will not only defend ourselves to the uttermost, but will make very certain that this form of treachery shall never endanger us again. Rankin was a pacifist who had also voted against the American entrance into World War I. For the second time, Congress reciprocated, declaring war on the European powers. Start your free trial today.

Chapter 6 : The Sirens of Death â€“ 11 Amazing Facts About the Ju 87 Stuka - calendrierdelascience.com

Definition[edit] A dive bomber dives at a steep angle, normally between 45 and 60 degrees or even up to a near vertical dive of 80 degrees with Ju 87 , and thus requires an abrupt pull-up after dropping its bombs. This puts great strains on both pilot and aircraft. It demands an aircraft of strong construction, with some means to slow its dive. The most famous examples are the Junkers Ju 87 Stuka , which was widely used during the opening stages of World War II , the Aichi D3A "Val" dive bomber, which sank more Allied warships during the war than any other Axis aircraft, [1] [2] [3] and the Douglas SBD Dauntless , which sank more Japanese shipping than any other allied aircraft type. The dive brakes are visible behind the wings. The crews of multi-engined dive-bombers, such as variants of the Junkers Ju 88 and Petlyakov Pe-2 , frequently used this technique. Dive bombing was most widely used before and during World War II; its use declined during the war, when its vulnerability to enemy fighters became apparent. In the post-war era, this role was replaced with a combination of improved and automated bombsights , larger weapons and even nuclear warheads that greatly reduced the need for accuracy, and finally by precision guided weapons as they became available in the s. Most tactical aircraft today allow bombing in shallow dives to keep the target visible, but true dive bombers have not been a part of military forces since the start of the jet age. In the case of a bomber flying horizontally, the bomb will initially only be travelling forward. This forward motion is opposed by the drag of the air, so the forward motion decreases over time. Additionally, gravity causes the bomb to accelerate after it is dropped. The combination of these two forces, drag and gravity, results in a complex pseudo- parabolic trajectory. The distance that the bomb moves forward while it falls is known as its range. If the range for a given set of conditions is calculated, simple trigonometry can be used to find the angle between the aircraft and the target. By setting the bombsight to this "range angle", the aircraft can time the drop of its bombs at the instant when the target is lined up in the sight. This was only effective for "area bombing", however, since the path of the bomb is only roughly estimated. Large formations could drop bombs on an area hoping to hit a specific target, but there was no guarantee of success, and huge areas around the target would also be hit. The advantage to this approach, however, was that it is easy to build such an aircraft and fly it at high altitude, keeping it out of range of ground-based defences. The horizontal bomber was thus ill-suited for tactical bombing, particularly in close support. Attempts at using high-altitude bombing in near-proximity to troops often ended in tragedy, with bombs both hitting their targets and friendly troops indiscriminately. In attacking shipping, the problems of inaccuracy were amplified by the fact that the target could be moving, and could change its direction between the time that the bombs were released and the time that they arrived. Successful strikes on marine vessels by horizontal bombers were extremely rare. An example of this problem can be seen in the attempts to attack the Japanese carriers using Bs and Bs at altitude early in the Battle of Midway , with no hits scored. Dive bombing[edit] An aircraft diving vertically minimizes its horizontal velocity component. When the bomb is dropped, the force of gravity simply increases its speed along its nearly vertical trajectory. The bomb travels a virtually straight line between release and impact, eliminating the need for complex calculations. The aircraft simply aims at the target and releases its bombs. As bombs are streamlined and heavy, wind has only a slight effect on them and the bomb is likely to fall within its lethal radius of the target. Bomb sighting becomes trivial, requiring only a straight line of sight to the target. This was simplified as the aircraft was pointed directly at the target, making sighting over the nose much easier. Differences in the path of different bombs due to differing ballistics can be corrected by selecting a standardized bombing altitude and then adjusting the dive angle slightly for each case. As the bomber dives, the aim could be continually adjusted. In contrast, when a horizontal bomber veers offline while approaching the bomb release point, turning to the angle that would correct this also changes the speed of the aircraft over the ground when there is a wind and thereby changes the range as well. In the s and early s, dive bombing was the best method for attacking high-value compact targets, like bridges and ships , with accuracy. The forces generated when the aircraft levels out at the bottom of the dive are considerable. The drawback of modifying and strengthening an

aircraft for near-vertical dives was the loss of performance. Aside from the greater strength requirements, during normal horizontal flight, aircraft are normally designed to return to fly straight and level, but when put into a dive the changes in forces affecting the aircraft now cause the aircraft to track across the target unless the pilot applies considerable force to keep the nose down, with a corresponding decrease in accuracy. To compensate, many dive bombers were designed to be trimmed out, either through the use of special dive flaps such as Fairey Youngman flaps or through changes in tailplane trim that must be readjusted when the dive is completed. The drawback was that it flew nose up in level flight, increasing drag. Failure to re-adjust trim made the aircraft difficult or impossible to pull out of a dive. At higher levels, this was less of a problem, as larger AA anti-aircraft shells were fused to explode at specific altitudes, which is impossible to determine while the plane is diving. In addition, most higher-altitude gunners and gunnery systems were designed to calculate the lateral movement of a target; while diving, the target appears almost stationary. Also, many AA mounts lacked the ability to fire directly up, so dive bombers were almost never exposed to fire from directly ahead. Dive brakes were employed on many designs to create drag which slowed the aircraft in its dive and increased accuracy. Air brakes on modern aircraft function in a similar manner in bleeding off excessive speed. Some recorded altitude at the top and bottom of their dive in log books and in squadron records, but not the steepness of the dive. It was certainly not near-vertical, as these early aircraft could not withstand the stresses of a sustained vertical dive. Again, the angle of dive in these attacks was not recorded. The "TF" stood for "Trench Fighter", and the aircraft was designed to attack enemy trenches both with Vickers. Of the 37 Salamanders produced before the end of October , only two were delivered to France, and the war ended before those planes saw action. It had armoured protection for the pilot and a fuel system to attack at low level, but lacked dive brakes for a vertical dive. Heavy casualties resulting from air-to-ground attack on trenches set the minds of senior officers in the newly-formed Royal Air Force against dive bombing. So not until did the Air Ministry issue specifications for both land-based and carrier-based dive bombers. It had dive brakes that doubled as flaps for carrier landings. The American and Japanese navies and the Luftwaffe chose vertical dive bombers whose low speed had dire consequences when they encountered modern fighters. As Zeppelins were tethered close to stores of hydrogen, results were often spectacular. The cost in pilots was very high, with casualties on some days reaching 30 percent. Based on the Sopwith Snipe it had pounds kilograms of armour in the front end to protect the pilot and fuel against ground fire. While 1, were ordered, only two were delivered to France before the Armistice. Only were produced. Fuller published findings which were later taken up by Heinz Guderian to form the basis for the blitzkrieg tactics of using dive bombers with tanks employed by the Germans in â€" He was awarded the Military Cross for this and other exploits. But the heavy casualties to unprotected pilots cast a pall over the results and influenced RAF thinking for 20 years. It ran a series of tests at the Armament Experimental station at Orfordness in Suffolk. In principle, it obviated the need for a vertical dive. But they were not considered good enough to justify the expected casualties. The Royal Air Force , which took over both army and naval aviation in April , retired its Sopwith Salamander dive bombers at the end of the war. The later Salmson 4 was to be a ground attack and dive bomber, but production was cancelled at the end of the war. Mitchell became a strong advocate of dive bombers after witnessing British and French aerial attacks. Both naval staffs opposed the view taken by the respective airmen. During , Sanderson familiarized aviators of USMC units on the Atlantic coast with dive bombing techniques [24] Dive bombing was also used during the United States occupation of Nicaragua. The Aichi D1A 2, a carrier-borne dive bomber. The Imperial Japanese Navy ordered the Heinkel He 50 in as a floatplane and carrier-based dive bomber and embarked some on new carriers from in a developed form as the Heinkel He 66 , from which the Aichi D1A was further developed in Japan. The Luftwaffe confiscated a Chinese export shipment and ordered more. Targets were often likely to be a small or fast-moving and the need for accuracy made dive bombers essential. Udet, then a stunt pilot, flew one in aerobatic displays during the Berlin Olympic Games. Due to his connections with the Nazi party , he became the development director of the Ministry of Aviation Nazi Germany , where he pushed for dive bomber development. Against small targets, a single-engine dive bomber could achieve four times the accuracy at one tenth of the cost of a four engine heavy bomber, such as the projected Ural bomber , [30] and it could reach the battlefield well ahead of field artillery. Soon the Luftwaffe

issued a contract for its own dive bomber design, resulting in the Junkers K 47 , which, following extensive trials, would in turn result in the gull-winged Junkers Ju 87 Stuka a contraction of Sturzkampfflugzeug, literally "diving combat airplane". Several problems appeared, including the tendency of the fixed undercarriage to sink into soft ground and an inability to take-off with a full bomb load. Condor Legion experience in Spain demonstrated the value of dive bombers especially on the morale of troops or civilians unprotected by air cover. He also insisted, against the advice of Ernst Heinkel , that the Heinkel He bomber, ordered in November , be able to dive bomb. Lack of a sufficiently powerful, reliable powerplant fatally compromised its utility, it never performed in the dive bomber role, and the requirement was eventually dropped. The Skua had a secondary function [34] of intercepting attacks by unescorted long-range bombers. Just were built and it was relegated to target towing. Five airframes left behind in Halifax later reached the RAF, who quickly relegated them to the status of ground instructional airframes for the training of mechanics. It was to prove a potent weapon against surface ships. The writings of Colonel J. Fuller a staff officer and Basil Liddell-Hart a military journalist propounded the concept of mobile tank forces supported by ground-attack aircraft creating a breakthrough. These were eagerly studied by Heinz Guderian , who created the combination of Panzers and Junkers Ju 87s that proved so potent in Poland and France. The Stuka could be used as aerial artillery moving far ahead of the main forces with Panzers to smash enemy strong points without waiting for the horse-drawn artillery to catch up. It was central to the concept of Blitzkrieg which required close co-ordination between aircraft and tanks by radio. Both were level bombers with similar bomb-loads and entered service in Many were also supplied to the Soviet Air Force, which also used the Ilyushin Il-2 Sturmovik ground-attack aircraft in huge numbers. None of these were dive bombers. The invasion of Poland and the Battle of France saw the Stuka used to devastating effect. German blitzkrieg tactics utilised dive bombers in place of artillery to support highly mobile ground troops. The British Expeditionary Force had set up strong defensive positions on the west bank of the Oise River to block rapidly advancing German armour.

Chapter 7 : The History of Dive Bombing: A Comprehensive History from Onward by Peter C. Smith

Presents the history of the dive bomber told from both official records and eyewitness accounts, from the first true combat dive bombing by an RAF pilot in to the stirring wartime actions.

Dive bombing tactics using the example of Stuka. Dive attack of a Stuka during the Battle of Britain. The steep-dive attack was one of the most accurate ways of bombing. Furthermore, against operational targets, which were usually defended by anti-aircraft guns, the errors for all types of bombing were two or even three times as great as those indicated on the training ranges. Against say a circular fortification with a radius of 80yd, with moderately heavy gun defences, a Staffel of Ju87s stood a good chance of scoring four or five hits with large bombs. In each case the nature of the target dictated the bomb load carried by the Ju 87; against a concreted fortification, for example, a single SD would be used; against field artillery positions, a typical load would be one SC under the fuselage and four SCs under the wings the designation of a German high explosive bomb indicated the type of casing and the weight of the weapon in kilos. When approaching their target the Ju 87s would, typically, fly in three-aircraft Vics Ketten at about 15,ft, cruising at mph. Larger formations would be made up of several of these Vics in line astern, with a spacing of about yd between aircraft, up to a usual maximum of about 30 machines Gruppe strength. If there were fighters flying close escort, these would follow a weaving path behind and slightly above the dive-bombers; as the force neared the target the escort would split, one-third remaining at height while the remainder descended to about 3,ft to be in position to protect the bombers from enemy fighters as they pulled out of their dives. Prior to entering his dive the Ju 87 pilot switched on his reflector sight , trimmed the aircraft for the dive, set the pull-out altitude on the contact altimeter, closed the radiator flaps, throttled back the engine and opened the ventilation air supply to the windscreen to prevent possible misting as the aircraft entered the moist air lower down. The signal to attack was given by the formation leader starting his dive. For strikes on smaller targets the aircraft would move into echelon during the approach, and peel off and attack in line astern. Against larger targets for example, harbours or marshalling yards the dive-bombers would bunt over and attack by Vics; the pilot was able to see directly beneath his aircraft through a small window set in the floor, and so was able to judge when to begin his bunt. It took about 8,ft for it to reach its limiting speed of about mph, after which its velocity remained constant. The accuracy of the attack depended upon the accuracy with which the selected dive angle was maintained. To assist him the pilot had etched lines on the side panels of his canopy, rather like a protractor, on which he could align the horizon and read off his angle; after same practice, however, pilots were able to judge their dive angle to within fine limits without having to resort to this aid. A dive from 15,ft to a release altitude of 3,ft usual for attacks against defended targets took about 30sec, during which the pilot controlled his aircraft to hold the target in the centre of his reflector sight. Four seconds before the dive-bomber passed the pull-out altitude previously set on the contacting altimeter, the latter sounded a horn. When the horn ceased, at release height, the pilot pressed a button on his control column to actuate a powerful spring which returned the elevator trim tab to the neutral position; the aircraft, now in a tail-heavy configuration, began automatically to pull itself out of the dive. The pressing of the button had also started the run-down of the bomb-release distributor, and after a set time interval the bombs were released automatically; the special radius arm swung the fuselage bomb down and clear of the propeller disc. After the pull-out the pilot regained control and retracted the dive brakes, opened the throttle, trimmed for level flight and made his getaway. German Ju 87 Junkers dive-bomber Share this:

Chapter 8 : Tubbs Island Air to Ground Gunnery Range

Accounts of WW1 dive bombing may be obscured by the fact that at the time its often refered to as glide bombing not dive bombing (the engine was throttled back on entering the dive or even cut, the prop would then act as an air brake to slow the dive - WW2 dive bombers had purpose built air brakes - contrary to popular or Holywood.

In , the Northrop Corporation was taken over by Douglas, and the active Northrop projects continued under Douglas Aircraft Corporation. Navy and Marine Corps had placed orders for the new dive bomber, designated the SBD-1 and SBD-2 the latter had increased fuel capacity and different armament. The distinctive perforated split flaps or "dive-brakes" had been incorporated into the BT-1 to eliminate tail buffeting during diving maneuvers. It had increased armor , self-sealing fuel tanks , and four machine guns. Over 2, of these were built. A few of them were shipped to the Royal Navy for evaluation. SBDs were also sold to Mexico. The final version, the SBD-6, had more improvements, but its production ended during the summer of It lacked the tail hook used for carrier landings, and a pneumatic tire replaced the solid tail wheel. There were three versions of the Banshee A, AA and AB flown by the army to a very minor degree in the early stages of the war. Navy SBDs operating with their aircraft carriers , which did not operate in close cooperation with the rest of the fleet. An SBD flies over Enterprise. The carrier Saratoga is in the distant background near the top of the photo. SBDs were also used for anti-torpedo combat air patrols CAP and these scored several victories against Japanese aircraft trying to attack Lexington and Yorktown. SBD pilot Stanley "Swede" Vejtasa was attacked by three A6M2 Zero fighters; he shot two of them down and cut off the wing of the third in a head-on pass with his wingtip. They also caught two straggling heavy cruisers of the Midway bombardment group of four, heavily damaging them, with Mikuma eventually sinking. Instead, its pilots resorted to the slower but easier glide bombing technique. This led to many of the SBDs being shot down when they became vulnerable during their glide, although one survivor from these attacks is now on display at the National Naval Aviation Museum and is the last surviving aircraft to fly in the battle. On the other hand, the carrier-borne squadrons were effective, especially when they were escorted by their Grumman F4F Wildcat teammates. SBDs attacked Japanese shipping throughout the campaign, and proved lethal to Japanese shipping that failed to clear the slot by daylight. Three other Japanese carriers were damaged during the six-month campaign. While the American strength was dive bombing, the Japanese stressed their Nakajima B5N 2 "Kate" torpedo bombers , which had caused the bulk of the damage during the Japanese attack on Pearl Harbor. The force had about twenty minutes of daylight over their targets before attempting the long return in the dark. Of the aircraft, only made it back. Twenty were lost to enemy action in the attack, while 80 more were lost when one by one they expended their fuel and had to ditch into the sea. The Battle of the Philippine Sea was the last major engagement where SBDs made up a significant part of the carrier-borne bomber force. Marine squadrons continued to fly SBDs until the end of the war. Although the Curtiss Helldiver had a more powerful engine, a higher maximum speed and could carry nearly a thousand pounds more in bomb load, many of the dive bomber pilots preferred the SBD, which was lighter and had better low-speed handling characteristics, critical for carrier landings. The Dauntless was one of the most important aircraft in the Pacific War , sinking more enemy shipping in the War in the Pacific than any other Allied bomber. In addition, Barrett Tillman, in his book on the Dauntless, claims that it has a "plus" score against enemy aircraft, meaning it was credited with more victories over enemy planes than losses due to enemy action. This is considered to be a rare event for a nominal "bomber". The Navy placed emphasis on the heavier, faster, and longer-ranged SB2C. Its battle record shows that in addition to six Japanese carriers, 14 enemy cruisers had been sunk, along with six destroyers , 15 transports or cargo ships and scores of various lesser craft. Army Air Forces sent 52 A Banshees in crates to the Philippines in the fall of to equip the 27th Bombardment Group, whose personnel were sent separately. However, after the Japanese attack on Pearl Harbor , these bombers were diverted to Australia and the 27th BG fought on the Bataan Peninsula as infantry. While in Australia the aircraft were reassembled for flight to the Philippines but their missing parts, including solenoids, trigger motors and gun mounts delayed their shipment. Plagued with mechanical problems, the As were diverted to the 91st

Bombardment Squadron and designated for assignment to Java Island instead. Referring to themselves as "Blue Rock Clay Pigeons", the 91st BS attacked the enemy harbor and airbase at Bali and damaged or sank numerous ships around Java. On 26 July , seven As attacked a convoy off Buna , but only one survived: Regarded by many pilots as too slow, short ranged and poorly armed, the remaining As were relegated to non-combat missions. The ABs were then withdrawn from combat. The B model was similar to the previous A model but had a more powerful engine than either the A or AA. As a result, AB could fly slightly faster and higher than the earlier models. The AB lacked the small air intake on the top of the engine cowling present on the earlier models and that is an easy way to distinguish the B model. The USAF established a new designation system for its aircraft, eliminating the "A-for-Attack" category, through The twin-engined "A" versions were redesignated as bombers, with another Douglas Aircraft design, the A Invader becoming the B Invader. Most of the single-engined "A" aircraft were either classified as fighters, or scrapped. As a result, the Banshee was called the F Banshee, although this aircraft was scrapped in A total of Dauntlesses were ordered by the French Navy , but with the fall of France in the spring of that production batch was diverted to the U. Navy, which ordered more. They were used as trainers and close-support aircraft. This squadron flew from North Africa to recently liberated Toulouse to support Allied and French resistance troops. Later, the unit was assigned to support attacks on cities occupied by the Germans on the French Atlantic coast. French Navy Dauntlesses were based in Cognac at the end of In late during one operation in the Indochina War, Flotille 4F flew missions and dropped 65 tons of bombs. By , the French Navy removed the Dauntless from combat status although the type was still flown as a trainer through SBD-1 Marine Corps version without self-sealing fuel tanks; 57 built. SBD-2 Navy version with increased fuel capacity and different armament but without self-sealing fuel tanks, starting in early ; 87 built. SBD-3 began to be manufactured in early This provided increased protection, self-sealing fuel tanks, and four machine guns ; were built. SBD-4 provided a volt up from 12 volt electrical system; In addition, a new propeller and fuel pumps rounded out the improvements over the SBD Equipped with a 1,hp engine and an increased ammunition supply. A total of 2, were built, and a few were shipped to the Royal Navy for evaluation. In addition to American service, these saw combat against the Japanese with No. A few were also sent to Mexico.

Chapter 9 : Hawker Henley Light Bomber / Target Tug

Navy SBD "Dauntless" dive bombers delivered fatal blows against the Japanese carrier force at the battle of Midway using the same techniques you'll see in this film. A must for history buffs and.

Media A dive bomber is a bomber aircraft that dives directly at its targets in order to provide greater accuracy for the Aerial bomb it drops. This allows attacks on point targets and ships, which were difficult to attack with conventional , even en masse. Glide bombing is a similar technique using shallower dive angles that does not require a sharp pull-up after dropping the bombs. This can be performed by larger aircraft and but does not confer the same level of accuracy as a steep dive from a dedicated aircraft. Definition A dive bomber dives at a steep angle, normally between 45 and 60 degrees or even up to a near vertical dive of 80 degrees with Ju 87, and thus requires an abrupt pull-up after dropping its bombs. This puts great strains on both pilot and aircraft. It demands an aircraft of strong construction, with some means to slow its dive. This limited the class to light bomber designs with ordnance loads in the range of although there were larger examples. The most famous examples are the Junkers Ju 87 Stuka, which was widely used during the opening stages of World War II, the Aichi D3A "Val" dive bomber, which sank more Allied warships during the war than any other axis powers aircraft, Angelucci and Matricasrdi p. A Call to Arms: An alternative technique, glide-bombing, Glide-bombing should not be confused with , which are launched from bombers in level flight and the bombs themselves are designed to glide slowly towards their target. The crews of multi-engined dive-bombers, such as variants of the Junkers Ju 88 and Petlyakov Pe-2, frequently used this technique. Dive bombing was most widely used before and during World War II; its use declined during the war, when its vulnerability to enemy fighters became apparent. In the post-war era, this role was replaced with a combination of improved and automated , larger weapons and even that greatly reduced the need for accuracy, and finally by precision guided weapons as they became available in the s. Most Tactical bombing today allow bombing in shallow dives to keep the target visible, but true dive bombers have not been a part of military forces since the start of the jet age. In the case of a bomber flying horizontally, the bomb will initially only be travelling forward. This forward motion is opposed by the Aerodynamic drag of the air, so the forward motion decreases over time. Additionally, gravity causes the bomb to accelerate after it is dropped. The combination of these two forces, drag and gravity, results in a complex pseudo-parabolic trajectory. The distance that the bomb moves forward while it falls is known as its range. If the range for a given set of conditions is calculated, simple trigonometry can be used to find the angle between the aircraft and the target. By setting the bombsight to this "range angle", the aircraft can time the drop of its bombs at the instant when the target is lined up in the sight. This was only effective for "area bombing", however, since the path of the bomb is only roughly estimated. Large formations could drop bombs on an area hoping to hit a specific target, but there was no guarantee of success, and huge areas around the target would also be hit. The advantage to this approach, however, was that it is easy to build such an aircraft and fly it at high altitude, keeping it out of range of ground-based defences. The horizontal bomber was thus ill-suited for tactical bombing, particularly in close support. Attempts at using high-altitude bombing in near-proximity to troops often ended in tragedy, with bombs both hitting their targets and friendly troops indiscriminately. In attacking shipping, the problems of inaccuracy were amplified by the fact that the target could be moving, and could change its direction between the time that the bombs were released and the time that they arrived. Successful strikes on marine vessels by horizontal bombers were extremely rare. An example of this problem can be seen in the attempts to attack the Japanese carriers using Bs and Bs at altitude early in the Battle of Midway, with no hits scored. The German battleship Tirpitz was subjected to countless attacks, many while in dock and immobile, but was not sunk until the British brought in enormous Tallboy bombs to ensure that even a near miss would be effective. Dive bombing An aircraft diving vertically minimizes its horizontal velocity component. When the bomb is dropped, the force of gravity simply increases its speed along its nearly vertical trajectory. The bomb travels a virtually straight line between release and impact, eliminating the need for complex calculations. The aircraft simply aims at the target and releases its bombs. As bombs are streamlined and heavy, wind has only a slight effect on them and the bomb

is likely to fall within its lethal radius of the target. Bomb sighting becomes trivial, requiring only a straight line of sight to the target. This was simplified as the aircraft was pointed directly at the target, making sighting over the nose much easier. Differences in the path of different bombs due to differing ballistics can be corrected by selecting a standardized bombing altitude and then adjusting the dive angle slightly for each case. As the bomber dives, the aim could be continually adjusted. In contrast, when a horizontal bomber veers offline while approaching the bomb release point, turning to the angle that would correct this also changes the speed of the aircraft over the ground when there is a wind and thereby changes the range as well. In the s and early s, dive bombing was the best method for attacking high-value compact targets, like and , with accuracy. The forces generated when the aircraft levels out at the bottom of the dive are considerable. The drawback of modifying and strengthening an aircraft for near-vertical dives was the loss of performance. Aside from the greater strength requirements, during normal horizontal flight, aircraft are normally designed to return to fly straight and level, but when put into a dive the changes in forces affecting the aircraft now cause the aircraft to track across the target unless the pilot applies considerable force to keep the nose down, with a corresponding decrease in accuracy. To compensate, many dive bombers were designed to be trimmed out, either through the use of special dive flaps such as Fairey Youngman flaps or through changes in tailplane trim that must be readjusted when the dive is completed. The drawback was that it flew nose up in level flight, increasing drag. Failure to re-adjust trim made the aircraft difficult or impossible to pull out of a dive. Jungle Dive Bombers at War. John Murray, London, A dive bomber was vulnerable to low-level ground fire as it dived towards its target, since it was often headed in a straight line directly towards the defenders. At higher levels, this was less of a problem, as larger AA anti-aircraft shells were fused to explode at specific altitudes, which is impossible to determine while the plane is diving. In addition, most higher-altitude gunners and gunnery systems were designed to calculate the lateral movement of a target; while diving, the target appears almost stationary. Also, many AA mounts lacked the ability to fire directly up, so dive bombers were almost never exposed to fire from directly ahead. Air brakes on modern aircraft function in a similar manner in bleeding off excessive speed. Origins It is difficult to establish how dive bombing originated. Commanders urged pilots to dive from their cruising altitude to under to have a better chance of hitting small targets, such as gun emplacements and trenches. As this exposed the aircraft and crew to destructive ground fire in their unprotected open cockpits, few followed this order. Some recorded altitude at the top and bottom of their dive in log books and in squadron records, but not the steepness of the dive. It was certainly not near-vertical, as these early aircraft could not withstand the stresses of a sustained vertical dive. The last of the dive bombers: The Royal Naval Air Service was bombing the Zeppelin sheds in Germany and in occupied Belgium and found it worthwhile to dive onto these sheds to ensure a hit, despite the increased casualties from ground fire. Again, the angle of dive in these attacks was not recorded. The "TF" stood for "Trench Fighter", and the aircraft was designed to attack enemy trenches both with Vickers. Of the 37 Salamanders produced before the end of October , only two were delivered to France, and the war ended before those planes saw action. Davis, Mick Sopwith Aircraft; Crowood Press, Marlborough England, Whether the Salamander counts in more modern parlance as a fighter-bomber or as a dive bomber depends on the definition of "dive". It had armoured protection for the pilot and a fuel system to attack at low level, but lacked dive brakes for a vertical dive. Heavy casualties resulting from air-to-ground attack on trenches set the minds of senior officers in the newly-formed Royal Air Force against dive bombing. So not until did the Air Ministry issue specifications for both land-based and carrier-based dive bombers. It had dive brakes that doubled as flaps for carrier landings. The Hawker Henley had a top speed only slower than the Hawker Hurricane fighter from which it was derived. The American and Japanese navies and the Luftwaffe chose vertical dive bombers whose low speed had dire consequences when they encountered modern fighters. The last of the dive bombers. On 14 November , four Avro s attacked the Zeppelin factory at Friedrichshafen on Lake Constance , diving from to to ensure hits. As Zeppelins were tethered close to stores of hydrogen, results were often spectacular. The first use of dive bombing by the Royal Flying Corps, which had been urging its pilots to drop bombs at heights below in order to hit within of the target since February , was later that year. He dived from to before releasing his bombs. A few weeks later, Lieutenant Arthur Gould dived to just to hit buildings near Arras. The Royal Flying Corps developed strafing

with diving aircraft using both machine guns and small bombs as a deliberate tactic. The cost in pilots was very high, with casualties on some days reaching 30 percent. Orion Publishing The Sopwith Salamander was developed as the first dedicated ground attack fighter. Based on the Sopwith Snipe it had of armour in the front end to protect the pilot and fuel against ground fire. While 1, were ordered, only two were delivered to France before the Armistice. Only were produced. The initial impact at Cambrai was highly successful. Fuller published findings which were later taken up by Heinz Guderian to form the basis for the blitzkrieg tactics of using dive bombers with tanks employed by the Germans in â€" The Roots of Blitzkrieg: University Press of Kansas. He was awarded the Military Cross for this and other exploits. But the heavy casualties to unprotected pilots cast a pall over the results and influenced RAF thinking for 20 years. Interwar era The Royal Flying Corps was initially impressed with the potential of the dive bomber, but was aware of its suicidal nature. It ran a series of tests at the Armament Experimental station at Orfordness in Suffolk. In principle, it obviated the need for a vertical dive. Patrick Stephens, London. The results showed that a vertical dive into the wind sighting along the top of rather than through the sight was best. But they were not considered good enough to justify the expected casualties. The Royal Air Force, which took over both army and naval aviation in April , retired its Sopwith Salamander dive bombers at the end of the war. The later Salmson 4 was to be a ground attack and dive bomber, but production was cancelled at the end of the war. Mitchell became a strong advocate of dive bombers after witnessing British and French aerial attacks.