

The Hardest Days.

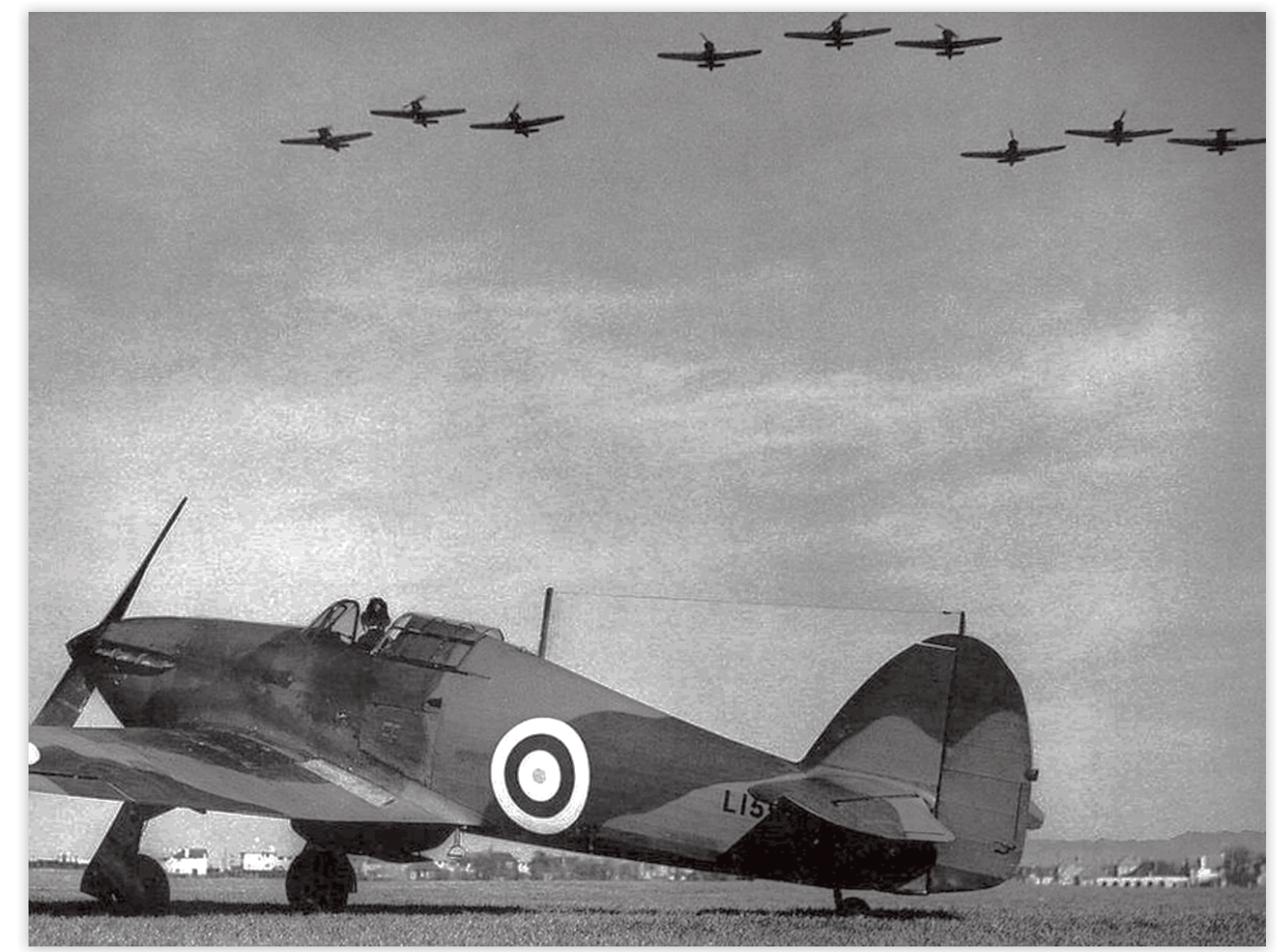
Turning Points in the Battle of Britain

by Roger Mason

Hitler was always circumspect about broadly sharing his true intentions for the war in Europe. In line with that, he developed the habit of taking aside individual military leaders and ostensibly telling his inner thoughts to them. In that way he disguised his deeper intentions while deflecting worries about getting into a war Germany wasn't prepared to win. For example, in the late 1930s he assured his nervous naval chief Grand Adm. Erich Raeder that there would be no war until 1944. To other commanders in the army and *Luftwaffe* he gave assurances any war would be limited to dealing with territorial issues directly affecting Germany.

If the war was several years away, and its goal was correcting nearby territorial disputes, military planners could concentrate on devising the strategies and weapons systems that would be appropriate for such a situation. It seemed logical, then, the German military concentrate on developing forces not intended for broader-ranging strategic conflicts. There would be no need for huge battle fleets or heavy bombers. German planners therefore developed innovative weapons and tactics that met the needs of the actual early-war campaigns. The *Luftwaffe* was admirably suited to conduct rapid attacks supporting mobile ground forces in areas close-by

Germany. In 1939 and 1940 the wisdom of that approach seemed validated by a year of continuous victory. Unlike those German planners, however, some key leaders in Britain were under no illusions about the potentially expansive nature of any new war. The anti-appeasement crowd, led by Winston Churchill, was firm in their belief about the potential for a massive and far-ranging conflict. Men like Air Marshall Hugh Dowding of Fighter Command believed every resource available must be directed at preparing for an all-out and sustained attack from Germany. Depression-era resources and budgets for the RAF remained tight, though,



The Intelligence War

The five keys to intelligence gathering for the British were: the Chain Home radar system, signals intelligence, the ability to decipher the German Enigma code, examination of downed German aircraft, and the interrogation of captured German aircrew.

The Chain Home radar system gave the British real-time tactical intelligence that allowed them to optimize their fighter deployment. While the radar's range was limited, the information provided by it gave the origin of the attack, its direction and approximate size, thereby also providing clues to its intended target.

The "Y" signals intercept system was based on a series of receiving stations that monitored German radio traffic. Data involving aircraft and unit call signs were analyzed against other intelligence sources. Those data, along with raw encrypted messages, were passed to the code breakers at Bletchley Park. Even Fighter Command and Air Marshall Dowding weren't initially given access to Enigma intelligence, but by the end of the campaign that had changed.

Because the battle was fought over England, nearly all crashed German aircraft landed in what was for them enemy territory. The wrecks were carefully examined for whatever intelligence they might yield. Likewise, German crews who bailed out were usually captured on landing. The only exceptions being some men and aircraft that crashed in the more distant parts of the Channel and North Sea.

The Germans had no such advantages. On their air staff, intelligence was under the Operations Staff and was known as *Abteilung V*. That unit's preliminary intelligence estimate of British air defenses was completed in July 1940: almost all of its conclusions were faulty. It minimized the capabilities and quantity of existing RAF fighters while also greatly underestimating the rate of fighter production. The Germans therefore expected the RAF to quickly run out of fighters. Further, the same report described the British radar system as "inflexible" and "ineffective."

Correspondingly, neither were the Germans able to use their *Freya* mobile radar system to gather much information about the RAF. They were at times able, by collecting "shadows" from Chain Home radar transmissions, to spot RAF squadrons as they took off.

Only a handful of British pilots fell into German hands. The *Luftwaffe* had gathered some intelligence on Fighter Command before the war, and their airfield strikes were based on that information. Unfortunately for them, many squadrons had since been moved and the Germans therefore repeatedly bombed airfields that were only being used as emergency landing strips.

The British also conducted several deception operations. Dummy radio stations were set up to transmit simulated radar transmissions and radio traffic in case a Sector Control or Chain Home station was damaged. That led to the false impression among the Germans those facilities couldn't be destroyed by bombing. The British also placed fake battle damage and dynamited some empty buildings on their airfields. That fooled the Germans into believing the bombing campaign was having a serious impact on British operations, and led them to the mistaken belief in early September that the RAF was finished. Overall, then, the British clearly won the intelligence battle from July to September 1940. ★



A German Enigma machine

even as Dowding worked on developing aircraft that would be capable of successfully defending England. Hurricane and Spitfire fighters were put into production. One important innovation was adding additional machineguns that would be needed to speedily knock down larger aircraft like a Heinkel 111 or Dornier 17 bomber. The Hurricane was a rugged and steady gun platform, which was perfect for attacking bombers. The Spitfire was fast and was a match for the German Me-109 fighter.

Effort was also put into the development and survivability of command and control systems. Even as the first early warning radars were installed, Dowding insisted communications and power lines to that system's various command and control centers all be laid underground.

Hitler believed his 1940 invasion of France, while risky, would ultimately be successful; however, no one, not even he, could've predicted just how successful that attack would be. In six weeks the Germans were on the Channel, while the British ground force was effectively toothless after the Dunkirk evacuation.

Both sides' generals and admirals realized command of the airspace over the Channel and southern England was mandatory to stop decisive intervention by the British fleet against any amphibious invasion. The first step to being able to launch any invasion therefore lay in destroying the RAF. The difference between the British and German appreciations of the situation came from the fact the latter's successes in the war up to that time had been based on tactical and operational innovations related to ground warfare. The Germans had given little thought to what a strategic air campaign would be like.

After three weeks of assessing the new strategic potentials inherent in the surrender of France, Hitler was ready for his next move. On 30 June 1940 a new directive was issued, under the hand of *Luftwaffe* chief Hermann Goering, for an air war against Britain. That gave little time for planning and preparation. It was followed on 1 August by a directive (No. 17) from Hitler himself, which defined the mission of the *Luftwaffe* as being to intensify operations against England to the point that nation's ultimate defeat would be assured. Targets would be aircraft units and their support organizations, aircraft production facilities and, more generally, the entire British defense industry. Secondary targets would be shipping and ports, in order to cut the import of food and supplies.

Those were sound strategic objectives. The problem was such a campaign would, given the tactical nature of the *Luftwaffe*, have to be based on improvisation and luck. The British had for several years correctly estimated Hitler's deeper intentions and objectives concerning their country. They had therefore prepared to defeat just such a campaign.

10 July–7 August: Shadow Boxing

German staff officers began drawing up detailed plans for the invasion of England, codenamed Operation Sea Lion. Preliminary discussions were held between the navy and army. Hitler was told it would take a minimum of five weeks to collect and retrofit enough barges and other watercraft to move the required ground force across the Channel. While the army and navy prepared, the goal of achieving air superiority was turned over to the *Luftwaffe*.

Reichsmarshal Hermann Goering ordered preliminary probes against the RAF defense system. British fighters seemed to be scarce except for patrols over ships in the Channel. *Luftwaffe* unit commanders were told to get their aircrews familiar with that coast and the interior of southern England just beyond it. German mobile radar units were moved to the French coast,

but they were only used to watch for convoy traffic in the Channel.

On 1 August the Germans conducted small raids and reconnaissance flights against targets from Scotland south to the Channel ports. RAF fighters remained scarce. The Germans also attempted to influence public opinion by dropping leaflets containing Hitler's latest speech to the *Reichstag*, which offered the British terms for an armistice. That morning Goering called his commanders to Amsterdam for consultations. He wanted to know what the enemy was doing: was withholding fighters a calculated tactic or were the British low on pilots and planes?

Goering also outlined what he called his "bull's eye strategy." The *Luftwaffe* would begin the campaign by launching attacks against targets 90 to 125 miles from the center of London. Each week the goal would be to destroy 100 RAF fighters, and the targeting ring would also be tightened around London. As the targeting grew closer to London, the British government would be compelled to negotiate in order to avoid what today would be called "socio-political collapse." At the same time, some 400 to 500 British fighters would be destroyed during the tightening process. By then the invasion force would be ready and Sea Lion could be launched, if indeed it were still necessary. The five-week plan would be started on 8 August.

The British quickly formed a good idea of what was coming. The *Luftwaffe's* "Yellow Code" had been cracked in the early spring by the cryptanalysts at Bletchley Park (see sidebar). The Germans made a change to a new "Red Code" in April that resulted in a temporary decryption blackout, but by late May the British were again reading German messages.

Dowding determined the RAF didn't have to decisively beat the *Luftwaffe* to win the coming campaign. The important thing was to preserve an effective fighter force that would be available if the Germans launched an invasion. The RAF therefore didn't take the bait of the early attacks on the Channel ports and sites in southern England. From the German viewpoint the situation remained vague and British capabilities uncertain. Goering therefore decided to step up operations.

5 August–6 September: Destroy Fighter Command

British intelligence could see the Germans were making invasion preparations. Photoreconnaissance flights showed coastal craft and barges being readied. Bletchley Park noted the acceleration of German radio traffic directing units to the coast.

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Chain Home Radar & RAF Fighter Control

In the early 1930s visionaries like Hugh Dowding recognized the RAF had no effective countermeasure to use against high altitude heavy bombers. Some suggested the answer was an H.G. Wells-type "death ray." Early experiments soon validated the mainstream belief such a weapon was impossible with the technologies then available. Those experiments did, however, yield one interesting result: the radio waves beamed at test aircraft bounced off their surfaces and, by being continuously recollect and analyzed, could be used to reveal those planes' location, elevation and direction.

Robert Watson-Watt and his staff at the National Physical Laboratory then began working on a dependable system for spotting aircraft using radio waves. That system was called "R.D.F." for "Radio Direction and Finding." The Germans were also working on RDF technology, but their systems were at first intended only for use by warships. An early version of their naval *Würzburg* targeting radar was fortuitously recovered by British intelligence from the scuttled battlecruiser *Graf Spee* in 1939.

The design for the first British radar system was developed by Arnold Wilkins, who reported his findings to Watson-Watt. He in turn advised Dowding that RDF worked. He then further requested 10,000 pounds to establish such a system to protect all of England.

Dowding replied he wouldn't support any such development until he'd seen a successful test. A test was set up in which an RAF bomber was flown back and forth while being successfully tracked by RDF. Dowding approved the new system, which was codenamed Chain Home.

The system consisted of a series of 360-foot fixed towers with wire strung among them. It could determine: range, bearing, formation size and altitude. Altitude remained the most problematic factor throughout the Battle of Britain, in that atmospheric conditions could alter those readings. RAF fighter pilots soon learned to always add several thousand feet to any radar intercept vector given to them in order to be sure they didn't arrive beneath the plotted enemy aircraft.

Another challenge was the radar's range. The first RDF systems had a 50-mile range, which was then gradually increased to 120. That allowed Fighter Command to "see" into occupied France and watch as the German formations actually took off. In addition to maximum range, the radar had a minimum range as well. As aircraft crossed the English coast they became too close for Chain Home to continue to monitor. That led to the redeployment of the Observer Corps, which had first been established to report Zeppelin raids during World War I.

In that regard, popular fiction and movies

often portray elderly English spinsters with field glasses patiently counting German bombers as they roar overhead toward London. That simplistic representation masks the true workings of the system. By the start of the Battle of Britain over 30,000 observers were in place and organized into groups covering all England. They tracked enemy aircraft, confirmed kills and provided post-raid information on enemy flight paths.

The OC members wore RAF overalls known as "boiler suits," and standard "soup plate" steel helmets with the letters "O.C." stenciled on the front. Each observation post had a telephone wired for direct contact with Fighter Command headquarters at Bentley Priory and the closest Sector Control. The system was at once large, simple, robust and effective.

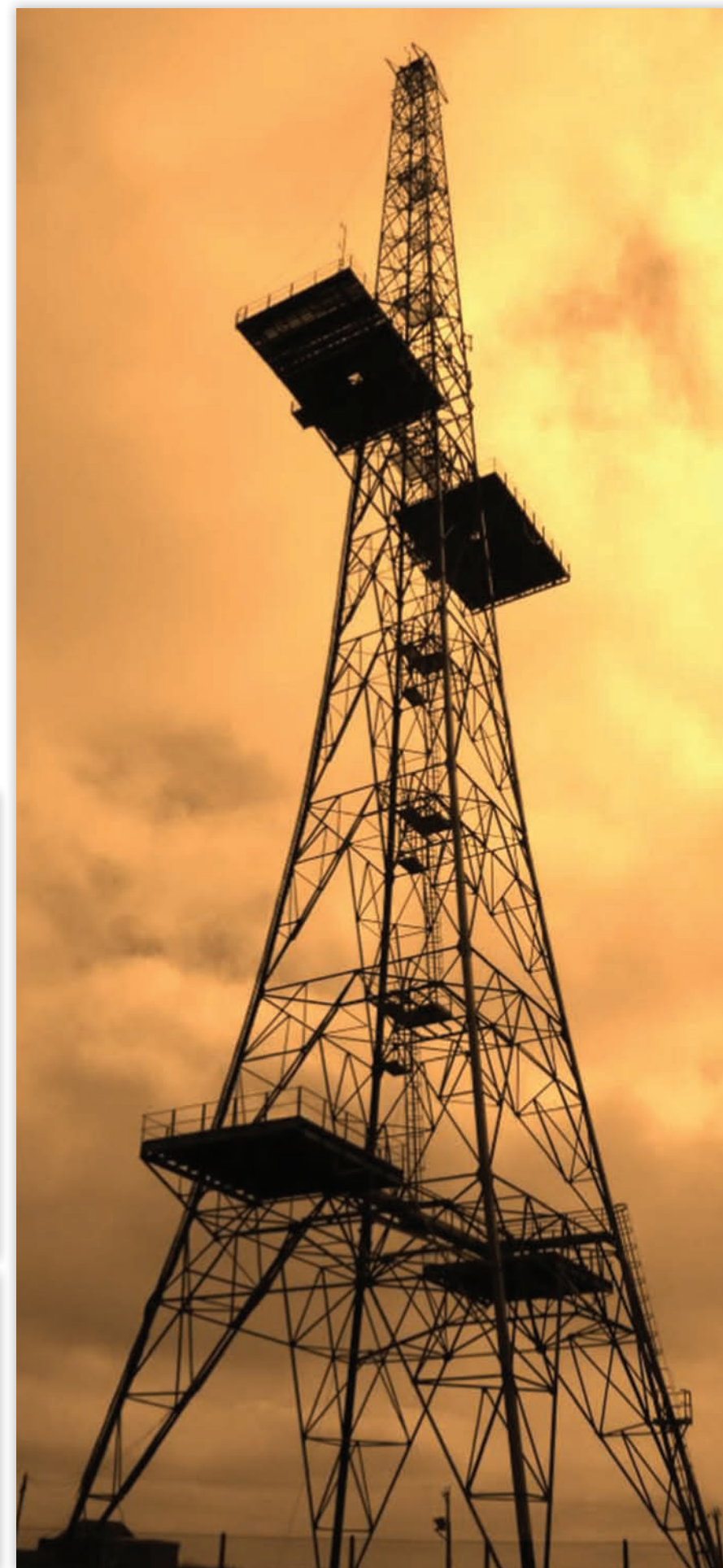
When an incoming attack was detected, that Chain Home station's tracking team contacted Fighter Command, where the hostile contact was plotted on a large map. That information was telephoned to the Fighter Group nearest the attack. The information was also phoned to the relevant Sector Control. Sector Controls were individual air defense sectors responsible for fixed defenses like barrage balloons and anti-aircraft artillery as well as fighter squadrons. Sector Controls coordinated local air defenses and in turn

transmitted the orders of the Group Commander.

As RAF squadrons scrambled, their flight paths were tracked by direction finding stations. RAF fighters carried a transponder that identified them as RAF aircraft. That was known as "I.F.F." or "Identification, Friend or Foe." Reports from the ground observers, RAF pilots, and direction finding stations kept Sector Controls informed of the progress and location of each battle as it moved inland.

That information was sent back up the chain to the Group Commands and Fighter Command. It was also broadcast to all sectors to help them track the course of the battle. That allowed other nearby sector controllers to take over if the primary Sector Control station was destroyed or knocked off line. As each battle progressed, Fighter Command was always ready to order in squadrons from neighboring groups if the primary squadrons required reinforcement.

The Chain Home system supported by Sector Control was never even temporarily, let alone completely, destroyed. Faulty German intelligence estimates had convinced Goering the system wasn't worth the effort to destroy it. When attacks in August did threaten to collapse the system, the Germans switched strategies due to the lack of visible results. Thereafter they simply ignored the tall towers along the English coast. That proved a costly error. ★



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The first significant aerial action by the Germans occurred on Monday, 5 August at 8:30 a.m. The Chain Home system detected some 50 hostile aircraft on route to the Dover area. *Fighter Group 11* sortied four squadrons of

Spitfires and Hurricanes to intercept. The Germans then withdrew.

August 6 and 7 were relatively quiet, with only some small raids and some reconnaissance flights. The lull ended on Thursday the 8th when an inbound merchant convoy passed the Isle of

Wight escorted by several squadrons of fighters. The Germans launched three successive attacks of 100 planes. That afternoon a second convoy off Bournemouth was hit by five similar attacks. Fighter Command responded by launching over 600 fighters and patrol planes, for a total loss of 17 aircraft.

The fighting continued throughout the week. The Germans were enduring mounting losses, but they hadn't destroyed the 100 British fighters their planners estimated were needed weekly to crush the RAF. The attacks on the convoys had brought out Fighter Command, but there seemed to be no fewer Spitfires and Hurricanes than when they'd started. Goering decided it was time for a knockout blow, and scheduled a major effort for the morning of 12 August.

A special unit called *Erprobungsgruppe 210 (Operational Trials Wing 210)* was readied. Me110s had been modified along with some Me109s to carry small bomb loads. The idea was those aircraft would approach at low altitude and make precision strikes. Their targets were the British radar towers. The attackers successfully hit several of them. The Germans then waited to see if the overall system would fail.

The British, however, had anticipated attacks against their radar and had prepared a deception plan. Dummy stations capable of broadcasting simulated radar transmissions and radio traffic were standing by and immediately began transmitting. To the Germans there

seemed to be no break in radar service.

Throughout the day the Germans conducted raids of 150 to 200 aircraft against RAF airfields, Channel ports and convoys. The airfields at Manston and Hawkinge were heavily damaged. Preliminary estimates indicated the day had been successful for the Germans

even though there'd been no discernable impact from the radar station attacks. Goering decided the next three days would see a concentrated series of attacks starting on the morning of the 13th. He designated that day as *Adlertag* (Eagle Day). The goal was to strike a decisive blow against Fighter Command.

The morning of Eagle Day didn't begin well for the Germans. Spotty weather resulted in numerous sortie cancellations. The problem was all units didn't receive the abort code, and several attacks went ahead, resulting in scattered and disjointed

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Tactics

For the Battle of Britain the Germans and the British developed tactics suited to their respective strategies and aircraft inventories. The Germans didn't have a heavy bomber; however, they had three medium bombers: the Junkers 88, the Heinkel 111 and the Dornier 17. In addition they had the Ju-87 Stuka, which had been a highly effective tactical dive bomber against the Poles and the French during the previous year.

To protect those bombers the Germans had large numbers of Me-110 "heavy fighters." Those twin-engine aircraft carried two-man crews and were better armed than single-engine machines. The Me-110 had two 20mm cannon and four machineguns in the nose as well as one rear-facing machinegun. The Germans also had the Me-109 fighter. It was a high-performance interceptor armed with 20mm cannon.

The initial German strategy was to use Stukas to hit pinpoint targets. The medium bomber formations would be protected by close-in Me-110 escorts, while the Me-109s conducted free-range sweeps with large formations to destroy enemy fighters.

The British had two fighter types making up the bulk of their aircraft arsenal, the Supermarine Spitfire and the Hawker Hurricane. The Spitfire was the faster of the two and a great air superiority fighter. It could deal with German fighter escorts, thereby protecting the Hurricanes as they went after the bombers. The Sector Control and Chain Home radar systems meant the amount of time patrolling and watching for enemy formations was cut to a minimum. After each fight the RAF pilots could land and standby until the next attack.

As the campaign progressed, the Me-110s fell victim in nearly every engagement due to their lack of speed and maneuverability. The Stukas were simply too slow to operate in that kind of battle environment, proving easy targets for the Spitfires and the Hurricanes. The Me-109s were therefore seldom free to conduct the massive sweeps they'd planned; they had to stay close to the bombers and help fight off the combination attacks from the Hurricanes and Spitfires.

Dowding's strategy was to avoid all fighting that wasn't directed at destroying German bombers. When German fighter sweeps appeared the British pulled back, leaving the Me-109s with no one to fight. Later, when the *Luftwaffe* concentrated on London, the British employed a tactic called the "big wing," whereby six or more squadrons would intercept an incoming bomber formation. The big wings were awkward to organize and employ, but they were instantly and deeply demoralizing to *Luftwaffe* pilots who'd been told Fighter Command was finished.

Due to their range limits, German fighters had a maximum of 20 minutes flying time once they crossed the British coast. Their bombers had longer range, but were slower. Engaging in midair melees with the RAF rarely accomplished anything decisive other than using up fuel. When the German fighter escorts turned for home, the Hurricanes attacked.

The Germans were only able to destroy a handful of British aircraft on the ground. In Poland, France, and later in Russia, great numbers of Allied aircraft were destroyed while parked on their airfields. The Chain Home radar system gave the British warning of incoming attacks, and the British also built concrete revetments for their aircraft and dispersed them around the airfields. That limited losses due to nearby explosions.

The most effective tactic the Germans came up with was to simultaneously send small formations of bombers and fighters to many targets. Such efforts were hard for the British to track, and reserves had to be constantly kept back in case a massive raid followed. That meant many of the smaller attacks got through.

One of the worst German tactics was forcing Me-109 fighters to carry a single 500 lb. bomb. That reduced those planes' comparative performance from that of a racehorse to that of a plow horse.

The tipping point came in late August, when Hitler ordered the switch from targeting airfields to going after cities. While horrifying for the helpless civilians who lived through the "Blitz," that approach could never be decisive in crippling the RAF. Fighter Command's numbers remained stable. Dowding therefore knew the RAF would survive and there could thus be no invasion. The fighting continued into the new year, but the window of opportunity for the *Luftwaffe* had closed. ★



Code Breaking at Bletchley Park

When war with Germany became imminent in 1938, the British government purchased a 60-acre Victorian estate, Bletchley Park, in the town of Bletchley about 50 miles northwest of London. The site included a gabled mansion with spacious grounds and a lake with ducks. That estate was to be the secret headquarters for the Government Code and Cipher School (GCCS) and the Security Intelligence Service (SIS). A plaque quoting Shakespeare (Henry V, Act II, Scene II) in the mansion's entrance hall cites Bletchley Park's mission and accomplishment: "The King hath note of all that they intend, by interception which they dream not of."

The Foreign Office sought mathematicians, linguists, Chess champions and crossword puzzle experts to become cryptanalysts. The intelligence center became known as "Station X," since it was the 10th intercept station set up by the British. When the cryptanalysts were hired, they didn't know their mission would be to break the codes of what had been advertised as an "unbreakable machine," the German Enigma device. The task would be daunting: the German military sent over 3,000 such signals a day.

Dr. Arthur Scherbius, a German engineer, had invented the Enigma in 1922. (The word "enigma" comes from the Greek *ainigma*, meaning "to speak in riddles.") It was first exhibited at the 1923 Congress of the International Postal Union in Bern, Switzerland, and was intended for traveling businessmen to use to provide security for their telegrams. As it turned out few businesses were interested, but the German military quickly took notice of the device's potential. The *Wehrmacht* would use a total of 40,000 Enigma machines throughout World War II.

There were many versions of the Enigma, but the standard machine had a keyboard containing letters in the pattern of a normal "QWERTY" typewriter but without keys for numerals or punctuation. The machine contained a scrambler system of electrically connected revolving drums (rotors) powered by dry-cell batteries.

That arrangement changed the 26 letters of the alphabet as its operator typed each letter of a message on the keyboard. The original Enigma, with the three-rotor set up therefore provided (26x26x26) for 17,576 possible start states. When a movable ring was reset on which the letters A to Z were printed, and 10 cables were also reset between the letters, there were

a total of 150 billion possible substitutions.

The Germans sent the encoded messages between their various headquarters and units in the field by Morse code. Those dots and dashes were recorded at intercept locations ("Y Stations") located on the British coast. The intended recipient's Enigma machine, set up the same way as the sender's by previous arrangement, would decode the message back into plaintext. Such a complex system of letter substitution appeared to be unbreakable, but in 1939 the Poles provided the French and British with two reconstructed Enigma machines, and from that start Bletchley Park went on to become the code breaking capitol of the Allied world. The intelligence received through those intercepts and subsequent decodings became known as Ultra.

The code breakers found the Enigma coding process too complicated to solve entirely by manual methods. Such methods did, however, identify common phrases, like "Heil Hitler" or "please respond." Further, the Germans often aided manual decoding by sending those expressions in plaintext.

The code breakers called successful guesses at plaintext messages "cribs." Routine weather reports often provided excellent cribs, while captured codebooks also provided help as the war went on. With a probable plaintext fragment, and the knowledge no letter could be enciphered as itself, the code breakers could sometimes identify a corresponding cipher text fragment.

The leading cryptanalysts Alan Turing, Gordon Welchman and their team—then managed to design an electro-mechanical device they anachronistically dubbed "the Bombe," because it made a ticking noise when operating. They connected the Enigma rotor wiring to the Bombes using a schematic ("menu") based on cribs previously determined manually. The Bombes then disproved every incorrect setting and determined potential settings.

The Bombes, located in outstation locations, ran 24 hours a day. Almost 2,000 Women's Royal Navy Service (WRENS) personnel and over 200 RAF technicians staffed those locations.

German units in the field primarily used the Enigma, while their higher headquarters used a different machine, the Lorenz Cipher, to produce their coded messages. The larger Lorenz machine required a teletype—a device that allowed conversation in printed form over telephone lines—and fixed circuits. The code breakers nicknamed the German teletype "Tunny," and called its coded output "Fish."

One of Turing's team members, Tommy Flowers, then designed an electronic "Colossus," the world's first programmable computer, to attack the even more complex Lorenz machine code. The Colossus was successful, by 1943 proving able to handle thousands of daily intercepted messages. (At war's end, Churchill ordered the destruction of the Colossus machines because of their top-secret nature. One has since been rebuilt at the Bletchley Park Museum based on original design schematics.)

The number of persons allowed to receive *Ultra* intelligence was strictly limited. Those who knew the source of the intercepts were never allowed in areas where they might be captured. When information was distributed, there was always a cover story as to how it had been obtained (for example, via high altitude fly-over photography, spotter planes, spies on the ground, etc.). The "Special Liaison Unit Officers" who delivered the messages to Allied commanders destroyed the sheets of paper after the recipient read them. Messages weren't allowed to be transmitted or repeated.

Those who actually did the decoding were never allowed to see the larger picture of what they were doing ("compartmentalization"). Similarly, they weren't allowed to tell anyone the nature of their work, not even their families.

Everyone in the Bletchley Park intelligence community was required to sign the Official Secret's Act, which gave their oath to never reveal their work. Churchill later expressed pride in the success of the code breakers, lauding their dedication and secrecy by calling them "the geese that laid the golden eggs and never cackled."

Only 120 people started at Bletchley Park in 1939. By the beginning of 1944 that number had increased to 7,000; ultimately, by V-E Day, 12,000 worked there. Yet, despite all those thousands of potential security leaks, the work done at Bletchley Park remained unknown until Frederick Winterbotham's (authorized) publication of *The Ultra Secret* in 1974.

Allied supreme commander Gen. Dwight D. Eisenhower said Ultra was "decisive" in winning the war. It's since been estimated the work of the code breakers hastened the war's end by at least two years. Throughout the war the Germans remained unaware their Enigma and Lorenz codes had been broken. ★

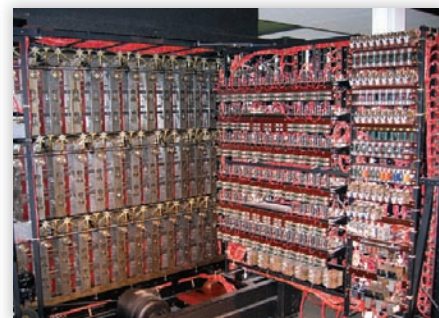
—Annie Laura Smith



Bletchley Park mansion



Alan Turing



The working rebuilt bombe

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operations. The British responded quickly, and many German aircraft were destroyed or damaged.

By the afternoon the weather improved. The afternoon attacks were therefore more successful, but scattered cloud cover still made overall bombing results inaccurate. Two RAF airfields were damaged. Fighter Command lost a total of 13 aircraft, but all pilots were recovered. The results for the Germans were therefore much less than decisive.

August 15 wasn't much better for them. The raiders hit some of the same airfields in southern England and bombed the Channel ports. Only four RAF personnel were killed, including three pilots. The attacks on the airfields were inaccurate, resulting in devastation to surrounding pastures but only moderate damage to the airfields.

An attack headed toward Edinburgh was picked up by Fighter Command. The Germans intended it to draw off defenders from the south. The prevailing wisdom was Fighter Command had its hands full trying to stop the southern attacks and wouldn't be able to respond. Due to the extreme range, the 72 He-111s of KG26 were coming unescorted from Stavanger. Dowding had anticipated such a move, and had *Group 12* rested and ready to meet it. The bomber force was decimated.

By that evening it was clear Eagle Day had generated greater hype than results.

Lots of unconnected real estate and private buildings had been destroyed, along with civilian casualties. Some airfields had been hit, but the damage was being repaired. The RAF had lost 34 aircraft, with a majority of the pilots recovered. The *Luftwaffe* had lost 75 aircraft with few pilots or aircrews saved. *Luftwaffe* pilots called it "Black Thursday."

Goring responded by declaring attacks on the Channel ports and convoys a "waste," and ordered that henceforth all efforts would be directed against airfields and aircraft factories. The news convoy attacks would cease was encouraging to Dowding; however, the corresponding decision to concentrate against airfields was a great concern.

August 16 and 17 were relatively quiet, but the 18th became known as the "hardest day" for Fighter Command. Starting at noon, hundreds of attacks hit RAF fields all over southern England. The British lost 22 aircraft. Churchill sat at *Group 11* headquarters to watch the battle unfold. All of that group's aircraft were committed, including the reserve. It was on the way home from watching the epic battle that Churchill uttered his now famous phrase: "Never was so much owed to so few by so many."

At the end of the day one statistic stood out above all others: on 1 August the British had 245 Spitfires and 341 Hurricanes; by the evening of the 18th the tally was 228 Spitfires and

396 Hurricanes. That was an overall increase, with just a slight decrease in Spitfire strength. Besides the material totals, losses of RAF pilots had also been kept to a minimum. Fighter Command was surviving.

August 24 was another day of maximum effort by *Luftflotte II*. It sent in a variety of attacks using some 200 aircraft. Southern airfields were hit again, and Fighter Command was stretched to the limit. In the intense combat 20 aircraft were destroyed, including two fighters lost to friendly fire. RAF airfields across southern England were pounded.

That night a small flight of Heinkels followed the course of the Thames to bomb some oil terminals. The bombers overshot their target and instead mistakenly struck the London dock district, causing civilian casualties. The next day Churchill and his War Cabinet met and ordered nighttime retaliatory attacks against five German cities including Berlin.

German losses were starting to climb. In August they lost 774 aircraft and 216 pilots. Most of those losses were from fighter attacks. Pilot and aircrew losses were also rising. Squadron commanders were reporting a significant number of accidents due to engine failure on take off. There was growing suspicion foreign workers in aircraft plants in Germany were sabotaging newly made engines.

Another factor in the German attri-



tion rate was the type of ammunition used by the RAF. The Me-109s were well armed with 20mm cannon, but the British were using incendiary ammunition in their Browning .303 machineguns. German aircraft that were hit therefore tended to catch fire and were rarely able to return to friendly airspace before crashing.

British losses were also climbing. Dowding asked that Channel convoys be limited. The large number of aircraft required to defend that shipping invited massive air battles, and most of the pilots shot down in them were lost due to drowning in the cold water. In battles fought over land the British pilots' survival rate was excellent, and aircraft production for Spitfires and Hurricanes was exceeding losses. The German quota of 100 British fighters

a week was still not being met.

Attacks on the Chain Home towers had caused damage and some temporary loss of coverage. The Germans were therefore increasingly able to surprise Fighter Command and strike targets unopposed. From the German perspective, however, attacks on the radar system seemed to have no effect due to the aforementioned deception operation. Goering, though, put it all together to mean the British were weakening and their radar had actually been of little use from the start.

For Fighter Command the biggest problem with the radar was estimating the altitude of tracked attacks. Fighter Command had dispatched interceptors to nearly every attack, but the technological inaccuracy in determining altitude often meant the defenders arrived

late or out of position. What Goering interpreted as systemic and material weakness was actually a continuing struggle to achieve effective command-control. Even so, the airbases of *Group 11* were becoming badly damaged and barely functional. Momentum was starting to move in the *Luftwaffe's* direction.

7 September–5 October: The Blitz

The affect of Bomber Command's retaliatory strikes against German cities struck home with Hitler. In his view those raids were an important political development. He'd been at his home at Berchtesgaden since 17 August, monitoring the campaign from there. On the 29th he returned to Berlin, having been moved by the bombing of the German

cities to declare the time had come to finally and fully break the British.

He selected London as the new primary target: attacks would switch from airfields and factories to that population center. To give more time for that change to work its effect, he also moved back the invasion launch-date from 15 to 21 September. On the morning of 7 September, Goering moved his headquarters in his private train to the French coast. He wanted to be in place to personally direct the attack against London.

From Enigma intercepts the British were informed as to what was happening. Fighter Command knew it would be a big day; they waited for the Germans to make the first move.

Mid-morning a group of 70 bombers attacked two airfields in the south. At about 4:00 p.m. radar reported another large enemy contact. From 4:30 to 6:30 p.m. over 350 bombers struck targets in southern England. That was followed by attacks on London all night. The fighting was intense. All of *Group 11* and five squadrons of *Group 12* were committed. Twenty-seven RAF aircraft were lost.

The rest of the month saw the constant night bombing of London. Fighter Command was losing aircraft, but most pilots were recovered and new production kept operational aircraft levels within acceptable limits. Civilian casualties were mounting, especially during the night raids, which were nearly impossible to stop. The *Luftwaffe* pilots were

facing hundreds of RAF fighters during the daytime raids; however, and Fighter Command remained far from defeated. Dowding was distressed over the civilian losses, but he recognized the momentum of the fighting had again turned to Fighter Command's advantage.

Attacks on airfields lessened as more and more effort was directed at London. The high attrition rate of the German bombers dropped with the move to nighttime bombing, but so did their bombing accuracy (never great to begin). Daytime bombing became prohibitive due to the heavy sustained losses.

September 27 brought a small victory for the *Luftwaffe* when a raid hit the Supermarine factory in Southampton, resulting in the temporary halt of Spitfire production. Even so, by the end of the month Hitler had to indefinitely postpone Operation Sea Lion. Fighter Command had won.

Conclusion

After three months of combat, the Battle of Britain evolved into a stalemate with the *Luftwaffe* legendarily but ineffectively night-bombing British cities. The RAF kept control of the daytime airspace over England.

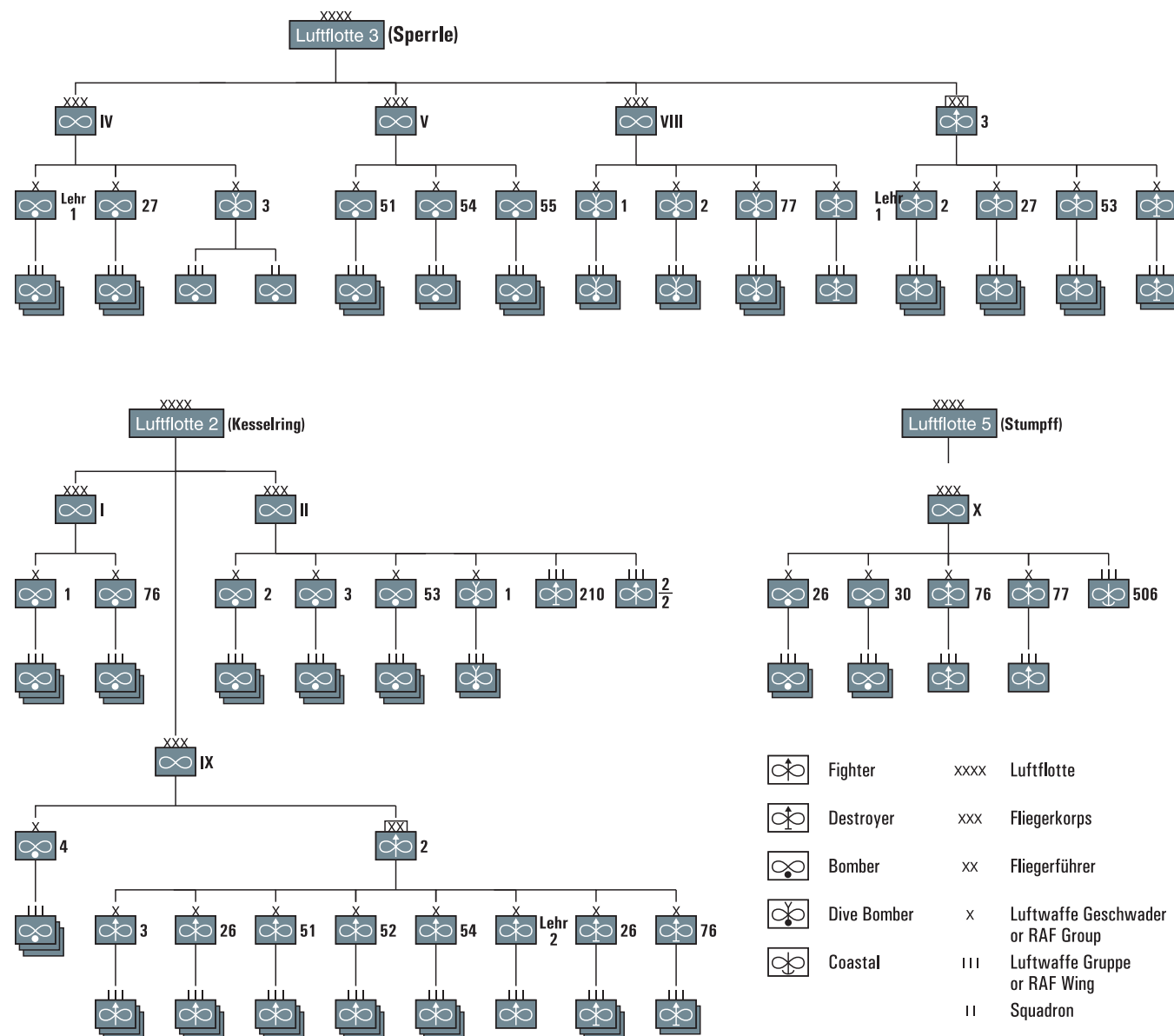
The first cause of that German defeat came from the simple fact the British were prepared for the battle while the Germans weren't. The British hadn't prepared for the mobile ground warfare of

the *Blitzkrieg*, but they were prepared for an air defense struggle over their homeland. The Fighter Command defenses were robust, with each component overlapping the next. That prevented sudden catastrophic failure. When the Germans knocked out part of the Chain Home radar system or a Sector Control center, the rest of the system was able to cover the temporary loss.

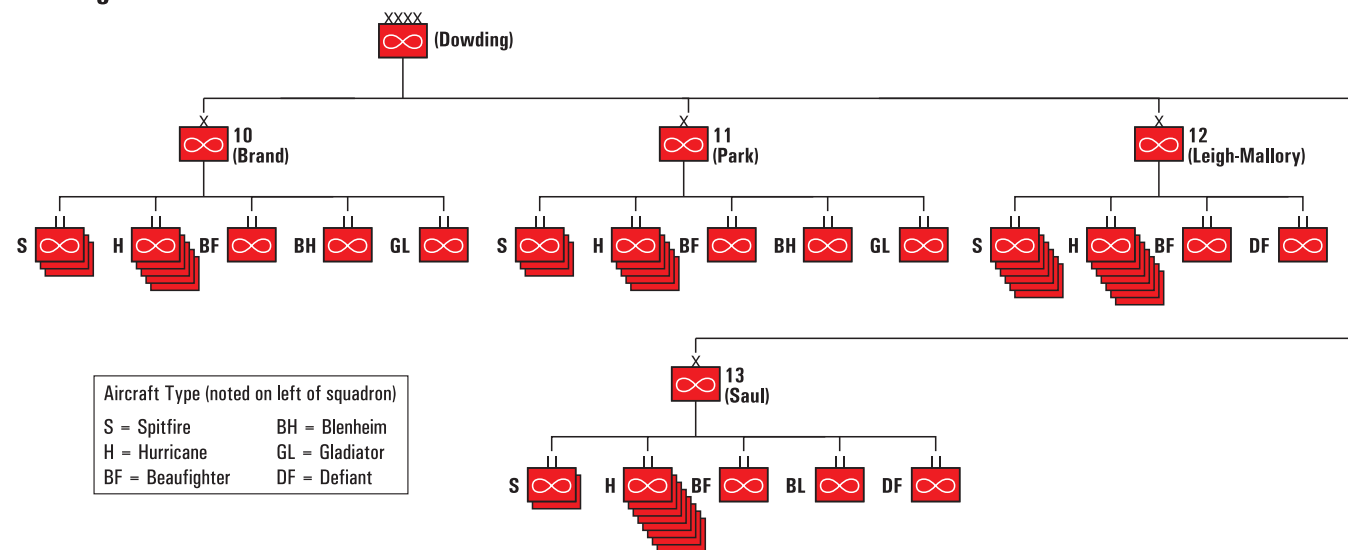
The aircraft of Fighter Command were well suited for the missions they were called to fly. The majority of British interceptors were Hurricanes. While not the most agile fighter of World War II, it was rugged, dependable, easy to build and deadly against German bombers. The Spitfire was less plentiful. During the three-month battle the total number of operational Spitfires varied from about 250 to 200. Spitfire performance equaled or exceeded that of the best German fighter, the Me-109. Because the British concentrated on the production of those two aircraft types, the Germans were never able to force the RAF past the tipping point of irreplaceable losses.

The Germans weren't prepared to fight anything like the Battle of Britain. Their *Luftwaffe* generals had been told to prepare for a limited territorial war. They'd therefore produced aircraft intended for close air support of mobile warfare near Germany. Their star plane for close air support, the Ju-87 Stuka dive bomber, was slow and nearly defenseless against fighter attack. The short range of their fighters limited escort protection

Luftwaffe Organization in the West 1940



RAF Fighter Command



Aircraft Type (noted on left of squadron)

S - Spitfire	BH - Blenheim
H - Hurricane	GL - Gladiator
BF - Beaufighter	DF - Defiant

and exposed their bombers to repeated attack. As the Germans transitioned to night attacks, civilian losses went up but bombing accuracy dropped.

Yet another significant difference between the *Luftwaffe* and the RAF lay in the minds and intuition of their leaders. Churchill recognized Dowding and his Fighter Command group leaders were competent and prepared for battle. The prime minister therefore watched the battle unfold but didn't interfere with it. He also understood the British people were determined to see the conflict through. He concentrated his personal efforts on supporting that critical morale factor.

The *Luftwaffe* was victim to frequent intervention by Goering and Hitler, which often led to poor choices, like requiring fighters to carry a 500 lb. bomb that robbed them of speed and agility. The Germans started with a workable plan, but it was discarded when Hitler's desire to punish the British took over. Over the course of the campaign the

Germans ended up lurching from objective to objective, with little effort given to actually analyze and evaluate efforts against results. Just when they were realizing results from their attacks on the airfields, they changed tactics. That demonstrated the inability of Hitler and Goering to make patient and rational decisions based on factual data.

The crucial fact was the importance Hitler placed on concentrating on defeating the will of his opponents. In the earlier campaigns against France, Belgium and Holland, those nations' governments, high commands and citizenry had rapidly become demoralized and then lost their will to resist. The British, spared by geography from having to fight a mobile ground battle, hadn't fallen into that trap.

Instead of the British, then, it was the Germans who became demoralized. The overall course of the Battle of Britain was controlled by the RAF and played to that service's strengths and advantages. The *Luftwaffe* pilots and

crews had been assured the RAF was already as good as defeated at the start of the fighting. During the daylight raids of mid-September, German bomber formations were faced with over 600 RAF fighters the pilots of which proved both capable and determined. It was therefore soon clear to all the British were far from defeated. ✪

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