

CALIBRATED LUFTWAFFE

by Robert D. Harmon

“Luftwaffe Organized” (Volume 10, Number 4) discussed the strategic aspects of the LUFTWAFFE game, e.g., the topography of the board, deployment, etc. This article will examine the tactical, historical, and auxiliary aspects of LUFTWAFFE in a detailed and compartmentalized form, from the story behind each aircraft to their game performance at the moment of attack.

This article will examine the background of each of the aircraft appearing in LUFTWAFFE. The performance statistics, of course, can be found in the LUFTWAFFE rules. However, there is a story behind each aircraft, and more than a cursory note is necessary to (to them justice. Understanding of the aircraft in the game can only follow the telling of their story.

BELL P-39 AIRACOBRA

One of the first of the USAAF's World War II generation fighters, the P39 was, in its day, quite an innovative aircraft. Introduced into active service in 1940, the P39, in a day when .30 caliber machineguns were standard pursuit armament-featured a 37mm cannon in the propeller hub, in addition to four MGs. To make room for the weapon, the Bell Aircraft Corp. adopted the radical expedient of moving the engine behind the cockpit, connected to the prop by a 10-foot shaft. The P39 was additionally unique in that it was the first major fighter to feature “tricycle” landing gear, i.e., with a center wheel in the nose rather than in the tail.

With the P40, the Airacobra made up most of the USAAF resistance to Japan in the early months of the war. It became quickly apparent that the Zero had rendered the heavier P39 instantaneously obsolete. After taking heavy losses in the first months of the war the P39 was gradually withdrawn as a tactical fighter.

Its powerful armament and remarkably durable construction, which had made it an unsuccessful fighter, now made the P39 an outstanding ground attack plane. In the South Pacific, in North Africa, and especially in Russia, the P39 performed outstanding service. It's most distinguished record was with the Soviet Air Force, which received almost 5000 P-39s, and an additional 2,400 P63 Kingcobras, a direct development of the P39.

The P39 appears in the LUFTWAFFE game nearing the end of its service as a fighter, serving a role it was increasingly unable to fill against more agile Axis opposition. The LUFTWAFFE model is the P-39Q, most of which served on the Eastern Front.

BOEING B17 FLYING FORTRESS

Because of the supreme importance of military aviation, many aircraft win a measure of fame. A few, such as the Sopwith Camel, the Zero, the F86, the F4 Phantom, and the MIG-21, can lay claim to greatness, the B17 Flying Fortress is no less than legend.

The B17 project came about as the result of controversy over the role and direction of the Air Corps. The military was

slow to accept bombers as anything other than an auxiliary; the Boeing Model 299 prototype (there was no XB17) was designed mainly for extended coastal defense. It was the first four-engine bomber to be considered by the U.S. Army, and the first all-metal four-engine bomber anywhere; its sheer size alone caused controversy. The 1935 crash of 299 seemed to prove the accusations of oversize and led to the adoption of the Douglas B18 ‘Digby’ in its place. Sheer persistence by Boeing and the Air Corps kept a few B17s around until 1940, when world developments brought a rash of orders.

1941 saw the lighter B17B, C, and D models give way to a major redesign, the B17E. Originally the bomber had a narrow tailfin and only a few fixed gun positions. The B17E featured the familiar curving tail, and introduced hydraulic dorsal and belly turrets, and also a tail gun position; also included were self-sealing tanks and armor. The redesign had come as a result of limited (and unfortunate) B17C duty with the RAF, and the B17E was entering service just in time for war.

After initial service in the Pacific, the B17 was relegated almost exclusively to Europe, where it became the crux and the focus for the daytime bomber offensive. Without it, USAAF daylight precision bombing may not have come off. Its stability, its armament, its range, and its unparalleled durability all contributed to get its mission accomplished. The B24, and other bombers, may have had more range or bomb load, but the B17 alone had the ability to endure some of the worst flak and fighter opposition of the war.

The wartime B17 models included the E, F, and G series, the last of which included a chin turret Axis fighter pilots had discovered early that the nose position was the most weakly defended. A B17H appeared in limited numbers as an air-sea rescue plane.

Although VE day marked the effective end of B17 service, the knowledge that had been gained from this pioneering design, from Model 299 through the battle-tested B17G, was to live on in a newer development: the Boeing B29 Superfortress.

CONSOLIDATED B-24 LIBERATOR

Developed for a 1939 U.S. Army requirement for a long-range bomber, the B24 featured a narrow, low-drag wing and a deep fuselage. The result was an aircraft that could fly further and hit harder than the Flying Fortress, or any other aircraft prior to the B29. Delivered to the USAAF and RAF Coastal Command for the first time in July 1941, it went on to serve in many capacities, on all fronts-the North Atlantic, Europe, Africa, China, the Pacific, Alaska. In Europe it served as a partner to the B17; taking a dominant role in southern Europe, including the famous 1943 strike on the Ploesti oil fields. The B24's range made it equally effective for operations throughout the Pacific and China.

Perhaps its most crucial role was as a patrol-bomber in the North Atlantic. Operated by RAF Coastal Command and by the US Navy, the Liberator extended Allied presence over most of the Atlantic; Liberators destroyed many, many U-boats far from land, and drove the Focke-Wulf Fw200 Condor from the skies.

Named as “Liberator” by the British, the BN went through many modifications through the war years. The B24D, G (which introduced the nose turret), and J models provided the

bulk of the Liberator force. As the F7, it served as a photo recon plane; as the LB30 and C87 cargo planes; and as a Navy patrol bomber, the P134Y.

CURTISS P40 WARHAWK

The USAAF's standard fighter at the time of Pearl Harbor, the P40 was a development of Curtiss' P36 Mohawk and Hawk 75 fighters. Although it had little more than durability to offer during the first, dark months of the war, it had one distinction: it was there, and it served.

Armed with four or six .50 caliber machineguns, the P40C, D, and E Tomahawk and Kittyhawk fighters formed the basis of Allied opposition to the Axis in 1941 and 1942, serving in the South Pacific, in China, and in North Africa. Initial combat service of the P40 was with Allied forces. P40s would win fame in China as part of the "Flying Tiger" unit serving with the Nationalist Chinese; P-40s also would see good service with the RAF. Although unsuitable for operations in Europe, the P40 proved valuable in Africa as a major part of the Desert Air Force serving in Egypt.

P40s also formed the first major USAAF resistance to Japan. Although heavy and less agile than the Zero; its durability, diving speed, and armament at least offered the Japanese some opposition. Such that it was, it helped check Japanese advances in New Guinea and the Solomons.

The P40 appears in LUFTWAFFE like the P39, in one of its lesser roles, as an adjunct to the Combined Bomber Offensive. Also serving with Soviet, Free French, Canadian, and South African forces, the P40 was to total some 14,000 aircraft.

DOUGLAS A20 BOSTON/HAVOC

The A20, first of the USAAF's twin-engine attack bombers, proved adaptable to a variety of roles, and served throughout World War II. First produced in 1939, it was immediately ordered by the French, and later by the British. By Pearl Harbor the A20 had seen wide service with the Third Republic, Free France, and Vichy, as well as with the RAF, which designated the bomber as "Boston".

It was also the RAF that would become the first to employ the A20 as a fighter, first as a fighter-bomber and shortly thereafter as a night fighter. The RAF had been able to adapt the A20 to help fill their need for fighter aircraft, as the USAAF was to do after Pearl Harbor. Besides extensive service in the Pacific, Africa, and Europe as a tactical and maritime bomber, the A20 also saw service as the P70, America's first effective night-fighter, and filled this need until the Northrop P61 Black Widow was ready for service.

Of the 7,000 odd A20s, the Soviet Union received 3,100 under Lend-Lease, employing it as a ground-attack aircraft. This combined with the numbers of P39s and P63s sent to Russia, only begin to underline the size and importance of the air war in Russia (no less than 35,000 Ilyushin IL2 Sturmoviks were produced) and of the Allied aircraft sent there to help.

The A20's dependability and excellent handling qualities made it an excellent craft for the air forces that used it; its adaptability makes its career as illustrious as its German counterpart, the Ju88.

LOCKHEED P38 LIGHTNING

Lockheed Corporation designers have had a long record of unusual and effective designs; the P80 Shooting Star, P2 Neptune, P3 Orion, F104 Starfighter, and YF12A/SR71 have all featured unorthodox lines and excellent service. So it was with the P38.

Entering production in 1941 with the USAAF and RAF (which named the fighter "Lightning"), the P38 was the best of America's in service fighters at the start of war, and was still in effective service at the end. In between, the P38 had compiled up an excellent record. It was the first USAAF fighter of the war to destroy an Axis aircraft (an Fw200). It was the first Allied fighter to match the Zero, by countering maneuverability with speed, armament, and durability. The P38 took the brunt of day-to-day operations against Japan, and accounted for more downed Japanese aircraft than any other Allied fighter.

In Europe, the P38 saw important service as an escort for the USAAF's bombers. The P38's range made it the first Allied daytime fighter to penetrate deep into Europe, and it provided effective cover for the bombers even after the P47 and P51 replaced it as a tactical fighter.

The P38 also saw important duties as a fighter-bomber, particularly in North Africa; as the F4 and F5 it was well employed as photo recon.

MARTIN B26 MARAUDER

The very capabilities that made the B26 an excellent medium bomber also contributed to an ugly reputation as a pilot-killer. A demanding aircraft to fly, it could, when handled right, live up to its name, and did.

There was no prototype. The Marauder was ordered right off the blueprints in 1940, and was in service by 1941. It served well on all fronts, and particularly well in Europe, where it was primarily employed. The B26 was particularly successful in tactical operations with the US 9th Air Force.

Primary versions of the B26 were in the B and C series. The B-26F introduced a larger wing, at the urging of the Truman Committee; the B26G was the final version produced.

NORTH AMERICAN B25 MITCHELL

Like the Martin B26, the B25 design was such excellence that it was ordered off the drawing board, entering service in 1940. The B25 went on to become the most outstanding American medium bomber of the war.

Employed on many fronts, including Europe, Africa, and China, the B25 saw heavy use in the Pacific. It served with great distinction with the US 5th Air Force in the South Pacific, flying in many low-level strikes on Japanese airfields and shipping. The B25, daringly launched from the USS Hornet, carried out the first strike on the Japanese homeland. Although of small military importance the 1942 strike gave a psychological boost to the Allied cause at a crucial time.

The B25's experiences in low-level attacks encouraged many modifications. Many models featured a solid nose; the last of them, the B25, carried no less than fourteen 50-cal machineguns and a 75mm cannon. This was followed by the B25J which reintroduced a bombardier in a transparent nose position, reinstating the B25 as a bona-fide medium bomber.

The B25J was the most produced model of the Mitchell; many B25Js served in Europe in the late years of the war. In fact, the B25 went on to serve with the USAF until 1960.

NORTH AMERICAN P51 MUSTANG

Originally built to British specifications, the P51 became the best USAAF fighter of the war. Although bettered by a few fighter designs, the P51 can rank as the most outstanding fighter of WWII for no other reason than the fact that we could not have defeated Germany without it.

Designed after the start of war to an RAF order, the P51 differed from then current US pursuit planes in that it was to have an inline engine and eight MGs. Originally equipped with an Allison engine, the first RAF P51s were given Rolls Royce Merlin engines; subsequently all American P51s were to carry the British designed engine.

Quickly adopted by the USAF, the P51 began service with the US 8th Air Force in 1943. Its range and high altitude abilities gave the Allies effective fighter range over Germany for the first time, not only as an escort but as a daylight tactical fighter. The P51 would eventually account for over 8,000 Axis aircraft in the ETO, and would provide most of the opposition for German interceptors.

The P51 also saw extensive escort service in the Pacific in the late months of the war, mainly with 20th Air Force B29s. The range problems encountered on these missions caused the USAAF to create the most unusual version of the Mustang: two P51 fuselages joined by a common wing and stabilizer, with two pilots and doubled range. The result was the P82 Twin Mustang. Although few appeared before VJ Day, the F82 became a standard postwar USAF escort fighter, and accounted for the first Communist aircraft shot down in the Korean War.

The P51 was also on hand to serve in Korea, and saw extensive ground-attack duty with the USAF and South Korean units. Surplus P51s (redesignated F51 after creation of the US Air Force) went on to long service with NATO, SEATO, and Latin American countries.

The F51 Mustang is in service with the USAF even today. Reinstated in 1967, the newest F51s have been assembled from P51 components and updated with the latest systems. They serve in Air Commando squadrons, mainly for counterinsurgent uses.

DOUGLAS A26 INVADER

Although it went from design to production during World War II, this excellent bomber, in a sense, is not a World War II aircraft. Although it was the last piston-driven, multi-engine attack bomber in American service, it saw only limited service in the last months of WWII. Technically, of course, it was the best attack bomber of the war.

Redesignated as the B26 after the passing of the Martin Marauder, the Invader did yeoman duty as a tactical bomber in the Korean War. In service with the USAF for over two decades, the B26 was modified as the B26K Counter Invader, and saw service through much of the Vietnam War.

SUPERMARINE SPITFIRE

In service throughout World War II, the Spitfire design proved of such excellence that it remained a first-rank fighter through 1945, while such longstanding fighters as the Me109 and Zero reached the limits of their design and began to fade. MkI Spitfires ensured England's survival in 1940; a MkXIV Spitfire became the first to knockdown an Me262 in combat. The Spitfire, which went through 24 models and six years of war, put together a record that makes it one of the greatest fighters in history.

Patterned after a series of prizewinning racing planes, the Spitfire was first flown in 1936, and was in service with the RAF as early as 1938. The MkI served at the Battle of Britain and was superseded in 1941 by the MkV, which was outclassed by the new Fw190 and in turn replaced by the MkIX, which became the most widely used of the Spitfire series. Although its role in the Combined Bomber Offensive was hobbled by short range, the Spitfire served with distinction with British forces over Britain and France throughout the war.

The Spitfire was also built for the Fleet Air Arm as the Seafire, a carrier-borne version that served from May 1945 through the Korean conflict. The Spitfire seen in LUFTWAFFE are MkVs, supplied under reverse Lend-Lease.

REPUBLIC P47 THUNDERBOLT

Originally designed as a lightweight fighter, the P47 became the heaviest single engine, propeller driven fighter ever built. Developed from the Seversky P35 and Republic P43, the Thunderbolt became the workhorse fighter in the European Theater of Operations, serving as a fighter, escort fighter, and fighter bomber.

The durability of the "Jug" rivals that of the B17. P47s have gone on record as returning minus half a wing, with half of the engine cylinders shot out, with so many holds that it often looked like a cheese grater rather than an aircraft. But P47s did return; its durability stood it a good stead in ground attacks, and even more so against less-durable German fighters.

The P47D, which appears in LUFTWAFFE, was the first to feature a "bubble" canopy, similar to the P51. The P47D and N models were the most produced of the 15,000 Thunderbolts. The latter N model, featuring longer range, served primarily in the Pacific.

NOTE: for a full order of battle of all USAAF groups in the ETO (not included in the LUFTWAFFE Campaign Briefing Manual), see the GENERAL May 1971 issue: Volume 8, Number 1.

DORNIER Do217

Developed from the famous Do17 "Flying Pencil," the Do217 appeared as a reconnaissance and torpedo-bomber in 1941. Eventually replacing the Do17, the 217 served as a bomber in various roles for the remainder of the war.

The Do217 saw widespread service, in modified form, as a night fighter. With a solid nose (a similar development was made in the B25), the Do217 was equipped for this role with radar and no less than four 20mm and four 7.9mm guns, with an additional 13mm for rearward defense. With similarly-adapted Ju88s, the Do217 saw good service defending German cities from RAF firebombing.

FOCKE-WULF Fw190

The first major German fighter since the Me 109, the Fw190 became the primary interceptor opposing the Combined Bomber Offensive, as well as superseding, but not replacing, the Me109 as the Luftwaffe tactical fighter. Although it had difficulties at higher altitudes, the Fw190A and D interceptors were the equal of any Allied fighter. The Luftwaffe's first radial-engine monoplane fighter, the Fw190 retained excellent maneuverability and speed, and was respected by its opponents.

FOCKE-WULF 'RAI52

Perhaps the best conventional fighter of the war, the Ta152 appeared almost too late to see effective service. Designed by Focke-Wulf designer Kurt Tank (hence the "Ta" designation), the Ta152C, the only operational model, started production at Sorau. Few were made before the Red Army took the plant.

The Ta152C featured an engine of 2100-2300 hp, and was armed with a 30mm cannon in the propeller hub, supplemented by four MG151 cannon.

HEINKEL HE162 SALAMANDER/ PEOPLE'S FIGHTER

The Volksjager was one of the most remarkable examples of the radical direction taken by German interceptor design. Built to a government specification of September 1944, the fighter was in the air no less than 10 weeks. Made primarily of plywood and other non-strategic material, the He 162 was designed to make up for the bombing of the conventional German aircraft industry, and eventually was to serve as the basis for an air going Volkssturm.

Armed with two 20mm or 30mm cannon, the He162A went into service with JG84 in the spring of 1945. Few were completed before VE-Day; fewer still ever saw combat. Besides design problems caused by the hasty appearance of the Salamander, the plane had proven to be extremely difficult to fly.

HEINKEL HE219 OWL

Originally proposed in 1940, official disinterest delayed the first flight of the He219, Germany's first genuine night fighter, until late 1942. Due to bureaucratic interference with the entire German twin-engine fighter program, less than 300 He219s were made, fortunately for the Allied cause.

Radar equipped, faster than 400 mph, and, armed with six 30mm and two 20mm guns, the He219 turned out to be the best night fighter of the war, surpassing even the P61 and Mosquito in

JUNKERS JU88

The Ju88 was the most adaptable of any combat aircraft of the war; it served throughout the ETO in virtually any role required of combat aircraft.

Originally designed as a medium bomber, the Ju88 appeared in 1937. It served in Poland, France, Britain, and Russia throughout the first years of the war in tactical and strategic roles, eventually superseding the He111 and Do17 in

these roles. Ju88s engaged Allied shipping from Norway and Italy, climaxed by General von Richthofen's strike on the Allied supply port at Bari in December 1943, sinking 17 merchant vessels (one of which turned out to be full of mustard gas, which caused over a thousand casualties) and causing a disaster rivaling Pearl Harbor; the British 8th Army and US 12th Air Force were neutralized for much of the winter,

Versions of the Ju88 bomber were also supplied to Italy and Finland; the Ju88 went through many modifications and continued into the Ju188 and Ju388 series.

Built also as a night fighter and destroyer, Ju88C and later modifications began service with NJG I in 1940. Some 6,000 Ju88 fighters were built to oppose Allied day and night bombers, carrying Liechtenstein radar systems and an assortment of up to six 20mm cannon, additional 13mm and 7.9mm MGs, and assorted rockets. The Ju88 was instrumental in the night actions against the RAF; between night fighters and German electronic advances the RAF Bomber Command was nearly driven from the sky in 1944.

HEINKEL HE219 OWL

Originally proposed in 1940, official disinterest delayed the first flight of the He219, Germany's first genuine night fighter, until late 1942. Due to bureaucratic interference, with the entire German twin-engine fighter program, less than 300 He219s were made, fortunately for the Allied cause.

Radar equipped, faster than 400 mph, and armed with six 30mm and two 20mm guns, the He219 turned out to be the best night-fighter of the war, surpassing even the p61 and Mosquito in some respects. Because of its small numbers, converted night fighters like the Ju88 and Me10 continued to form the bulk of German night defenses.

MESSERSCHMITT Bf110

Although somewhat underrated throughout its career, the Me110 gave excellent and versatile service throughout the war, and proved to be a valuable workhorse. Developed just after the Me109, the Me110 entered service too late for the war in Spain, and first saw action in Poland as an attack bomber.

Designed as a long-range escort fighter, the e1 10 was found wanting in this role in its first actions against enemy fighters. The clumsy aircraft was continually outclassed in clashes with British fighters and Swiss Me109s in the summer of 1940; the situation got so bad that 'Me110s required escorts of their own. The aircraft would probably have been replaced by the Me210, had not the latter proved to be a major boondoggle.

1942 saw the effective re-introduction of the Me110 as a fighter-bomber (Me110F) and night fighter (Me110G), roles in which it was to serve with excellence for the remainder of the war.

MESSERSCHMITT Bf109

The Me109 (the official "Br" designation refers to the Bayerische Flugzeugwerke, where it was originally produced) was one of the greatest combat aircraft in history. It served throughout the war; in fact, its active service spanned three decades, and was the most numerous fighter of the war: some 32,000 were built. It dominated the skies of Europe, almost

entirely on its own, for several years; even toward the end it offered opposition to Allied power.

First flown in 1935 and entering active service two years later, the Me109 was Germany's first monoplane fighter. Indeed, until the advent of the Fw190, it was the only German single-seat fighter, gradually replacing the He51. First combat was in the Spanish Civil War, where Me109Bs served with the Condor Legion; initially it was matched by Polikarpov I-15 and I-16 series fighters flown by Republican pilots. But the older Polikarpov fighters were at the peak of their development; the appearance of the Me109C established final Nationalist air supremacy in that war. Combat experiences led to the development of the Me109E ("Emil"), which were predominant in the first year of World War II.

The Me109 led the Luftwaffe to spectacular victories over the air forces of Europe, and was the key to the entire German offensive effort, which could not have succeeded without air superiority. There is even some conjecture that the Me109E-3, despite its limited range, might have won the Battle of Britain had they been directed more intelligently. Certainly the Me109 was a match for any Allied fighter in service.

The Me109E was briefly replaced by the F series, which sought to improve the plane's handling characteristics by removing the wing guns. The Me109F had a short and controversial career; never fully accepted by Luftwaffe pilots, despite the fact that it could out-maneuver the Spitfire V. The Me109F was replaced in 1942 by the most important and most widely used series of all, the Me109G ("Gustav"). Like previous models, the G series retained a 20mm cannon in the propeller hub (later changed to a 30mm MK 108 starting with the Me109G6) and two MGs in the nose. Unlike the 109E, the two wing-mounted 20mm guns were mounted under the wings, rather than in them. The Me109G saw action on all fronts and was increasingly called on to perform high-altitude missions against the USAAF. As good as the Fw190 was at low and medium altitudes, it was proving inadequate at higher levels. A few Me109H and K series fighters were completed to fill the gap before the appearance of the Ta 152, but by then the war was ending. As events proved, the Me109 had lasted so long that it, the Fw190, and the Ta152 were slated for replacement by the Me262.

Me109s were not limited to Luftwaffe service, nor does VE-Day mark the end of their story. Large numbers of Me109E and G series fighters had been exported to Spain, Yugoslavia (where they served against German Me109s), Hungary, Rumania, Bulgaria, Finland, and Switzerland, the latter using its Me109s on straying German Me109s, among others. The Swiss Me109 inventory consisted of both imported and confiscated Me109s. Spain and Czechoslovakia both produced Me109s after the war; the Czech version, the Avia S99 and S199, was the standard Czech fighter until the issue of MIG15 fighters in the early '50s. Some S199 found their way into the Israeli Air Force, serving in the 1948 War for Independence.

The Spanish version, which began manufacture during the war years, was the Hispano HA1109 and HA1112, the latter a fighter-bomber version powered with Rolls-Royce Merlin engines. Production ended in the late '50s; active service of the HA1112 continued into the late 1960s.

MESSERSCHMITT Me163 KOMET

At the dawn of the jet age, fighter development took a radical new direction in the mid-1940s with the appearance of the rocket fighter. During the early and mid-40s, the Soviet Union built the Bereznyak-Isaev BI-1, the United States brought out the Northrop XP79, Germany, in addition to the Komet, built the Bachem Ba349 Viper, and Britain followed in 1949 with the Hawker P1072. All these aircraft were rocket-powered prototypes for an innovative wave of fighters. All were passed by; war production priorities and the turbojet had overcome them, all except the Me163: the world's only operational rocket fighter.

The by-product of German advances in aircraft design and rocketry, the Me163 was developed through a series of powerless prototypes, while the rocket engines were still being readied. The Me163A (later used as a trainer) showed superb gliding characteristics, important in a fighter able to maintain only 8 minutes of powered flight. After a series of problems with the rocket engines, the Me163 went into service with JG400 in the summer of 1944, as a point-interceptor. Despite the volatile nature of the aircraft, which made take-offs and landings hazardous, and the fact that the extreme speed of the Me163 made accurate attacks difficult, the Me163 proved pretty much unstoppable.

The Me163B, the only operational version of the fighter, was a very small plane: it had a wingspan of 30 feet and a length of only 18 feet. The Comet could reach its ceiling of 39,500 feet in only 3 1/2 minutes. The Me163 was to be replaced with the Me263, a development of the Komet with more range and retractable, rather than detachable, landing gear; however, the war ended before it could go into full production.

Another development of the Me163 was the Mitsubishi J8 MI Shusui (Sword Wind), patterned after the Komet and built with German supplied information. The Shusui was developed by the Japanese Navy as a last-ditch defense against the onslaught of the 20th Air Force; the prototype flew in July of 1945 but did not enter production until the day of the surrender, 15 August 1945.

MESSERSCHMITT Me410 HORNET

The Nazi system is occasionally (and mistakenly) portrayed as the model of efficiency. It certainly wasn't apparent in the Third Reich's aviation industry. Plagued by mistaken doctrine (see "Luftwaffe Analysis," Volume 10, Number 2), bureaucratic meddling (not the least of which was the near suppression of the He219 and Me262), and punctuated by such disasters as the He177 and Me210, unrivalled by even the U.S. defense industry's best efforts, the German aerospace industry was shackled from beginning to end.

The German government, having committed itself to large orders of the Me210, found itself in a bind with the plane going from prototype stage (1939) into service (1941) with no improvement. The plane had rotten handling characteristics, and a bad tendency to crash. After extensive redesign the aircraft reappeared as the Me410 Hornisse (Hornet), and about a thousand of these were produced until 1944. Although the

aircraft had heavy armament and tolerable performance, its record was marginal at best.

MESSERSCHMITT ME262 SWALLOW

It was the first jet fighter in history, and easily the best fighter of World War II. The few that did see combat made the last months of the war most anxious for the 8th Air Force. Yet, the role of the Me262 was in the realm of might have been, a shadow of what could have been.

The first Me262 prototype flew in April of 1941. Government apathy and inadequate engines kept the aircraft in the prototype stage for two years. Finally demonstrated for Hitler in November of 1943, the Fuhrer stunned everyone present by ordering its production, as a bomber. When the 1944 production of the Me262AI fighter was discovered by Hitler, he ordered the conversion of those made into the Me262A2 Sturmvogel (Stormbird). Despite the new Junkers Jumo 004B turbojets, the bomber configuration slowed the aircraft to within the reach of Allied conventional fighters; in this role the Me262 was not only misused but redundant, as the Arado Ar234 Blitzjet bomber had already gone into production. Eventually Hitler was to give the Me262 fighter priority in production, but by then it was too late. Fewer than 200 of the 1,000+ production Me262s ever saw combat.

The LUFTWAFFE rules' Profiles and Data section alleges that the Me262 was "the most successful example or' mark this, "German genius." Nonsense!

Hardly a success, and "most successful of" an industry plagued with a TFX mentality isn't saying much. But "German genius?" By the time the Me262 went into production, the USSR had tested a rocket fighter; Britain had flown the Gloster E28/39 Pioneer, prototype in May of 1941, and had the Gloster Meteor jet fighter in production by July 1944. The United States produced two jet fighters that year, the Bell P59 Airacomet and the Lockheed P80 Shooting Star. The Meteor saw action in the last year of the war, most of it defending England from V1s.

DEWOITINE DE520

The best of the Arme'e de l'Air fighters at the start of the Battle of France, the Dewoitine 520 might have had a decisive impact on the war had it been produced in large numbers. However, production had been delayed by French government imposed modifications, and deliveries began in the spring of 1940. The Morane-Saulnier and Bloch fighters proved inadequate against the Me109E3, which would have found a match in the Dewoitine 520.

Production of the fighter continued until 1942 under the Vichy government. The German occupation forces, invading Vichy that November confiscated the 700 or so D520; giving many to Bulgaria, Rumania, and Italy, and using others to train pilots for JG103 and JG105.

After the invasion of France, 30 D520s were recaptured by Allied forces. These fighters subsequently saw good service in the forces of Free France, in the closing months of the war.

ANALYSIS AND TACTICAL EMPLOYMENT NUMEROLOGY AND A RATINGS

What follows is the result of an in-depth analysis. Problem: in order to accurately assess the relative worth of each aircraft, we must assess all of its characteristics as they appear in the game. E ratings alone won't do it, the He162 and Me262 have the same E rating, but I doubt if anyone can assert that the Salamander is better than the much more effective Me262.

It is a question, then, not only of the E ratings which represent the aircraft's effectiveness as a fighter (mainly its agility), but also of its hitting power, as represented in the confusion of the Aerial Combat Table.

I direct your attention to Chart 1, the Per Factor Effectiveness 'Fable (PFET). The PFET, the result of computer analysis of the LUFTWAFFE Air Combat Table (ACT), lists the average effectiveness of each factor in attacks of from 1-34 factors; the chart is laid out in comparative form, e.g., an attack of 5 P47s, given average results, will destroy the same number of enemy factors (per P47 factor) as with 5 Fw190 or 15 Me110 factors.

In basic terms, the PFET lists the average kills gained by one factor, as a part of a larger attack. If we were to, say, just analyze the average results of each attack, it would prove nothing. One look at the ACT should indicate to you what the over, all results will be, more units make a bigger bang and that's that.

But when we analyze the killing power of each factor, 3 important facts emerge:

- (1) With few exceptions, the effectiveness of each factor increases with the size of the attack. One Me262 by itself kills only 0.167 USAAF factors in an average attack, as part of a 28-factor (14 Gruppen) attack, that one factor gets .583!
- (2) A fighter that is in large numbers is more effective than some of the freaks in the game. Check the mean/factor (mean effectiveness per factor-the average of the recorded results in each column on the PFET) results on Chart 1. The Ju88 and Ta 152 use the same results column, but have different overall ratings. Because of the rules of attack, "best against the best" and so forth, the Ta 152 attacks by itself because of its higher E rating. But a number of Ju88s in the same attack is apt to get better results (see (1) above). Of course, against bombers, the Ta152 and Ju88 act together.
- (3) E rating and attack effectiveness are two different things. The Me410, few of them as there are, far exceed anything in the USAAF in deadliness.

Comparison of fighters in the LUFTWAFFE game must consider not only their E rating, but, coincidentally with that, their average per factor effectiveness, or A rating, as shown in the mean/factor results on the P-FET. Range, a third consideration, can be considered as an entity, as the game presents it as an abstract. What has been discussed in this presentation underlies everything written in the more general tactical commentaries below.

(NOTE: the A factors of aircraft sharing the same ACT column and E rating, the B17 and B24, the Me163 and HeJ62, and He219 and Do217 are similar because, when together, they can attack as one group, whereas the P40 and P51, or Ta152 and Ju88 must attack by E rating, under the rules.)

ANALYSIS AND TACTICAL EMPLOYMENT AIRCRAFT COMMENTARIES

Here follows a type by type discussion of the properties and uses of the aircraft that appear in LUFTWFFE.

Fw190 E rtg 4/3s A rtg 0.510 Fuel 4/3

This aircraft, by virtue of its numbers and relative effectiveness, is the backbone of the German defenses. It has enough range to operate in most areas of Germany and Austria, enough E rating to take on USAAF fighters, and enough hitting power to make it count.

It is suggested that the aircraft be employed as one large force, to augment effectiveness, based in the Schweinfurt-Karlsruhe sector. If the US goes for northern or central Germany, it can move north quickly and intercept over Hesse-Kassel or in front of Hannover. If the main American effort comes from the south, the Fw190s based in southern Germany, can cover the back door of the Reich.

Wherever it is employed, it must be at the forefront of the interception. Twin-engine fighters can't cope with US fighter opposition; the Me109s short range chains it to areas with lots of airfields. What's more, the Germans can't afford to suffer heavy Fw190 losses; if it hits the US fighters it must hit with every Fw190 available, and other fighters if available, to forestall counterattack. The German must also consider the Fw190, because of its endurance, its best weapon against bomber forces. To sum up: the German must use judgment, and decisiveness, in employing the Focke-Wulf; more importantly, its power requires that it be kept busy.

Me262 E rtg 6 A rtg 0.538 Fuel 2

This fighter, by virtue of its E and A ratings, is the best the Germans have. But it isn't a cure-all for the German's defensive ills; it has inherent weaknesses and must cooperate with conventional fighters if it is to survive.

The advantage of the Me262E rating and hitting power; are obvious. But its drawbacks are not always recognized. The aircraft's poor endurance and its being tethered to designated jet airfields put it at a disadvantage. US fighter groups can enter its area, if close to the front, wait for it to land, and then strafe if when it no longer has an E rating to protect it. Me262's, unless in large (non-historical) numbers, can't really retaliate as overwhelmingly,

The Me262 is all at its best as a bomber interceptor. It can score impressive results without suffering return fire, and its E rating can help cover the whole attacking force from fighter retaliation. It is at its best in rear areas, based away from US fighters and able to serve as a backup for the conventional fighters. The Me262 should be based in the Brunswick-Leipzig-Berlin area, as most bomber missions will come in this direction anyway, particularly in the closing months of the war.

Me109 E rtg 3 / 2s A rtg 0.432 Fuel 4/2

The most numerous of the German fighters, it takes second in importance to the less plentiful Fw190 because of the Me109's short range. Between its large numbers and need for frequent refueling, the Me109 has to have large numbers of

airfields present; this limits its operational area to northern and central Germany. Also, the threat of US strafing keeps the Me109 pretty well out of any airfield within seven hexes of the R line, including every airfield in Holland and the Ruhr. This usually puts the Me109 front-line effort in the Wilhelmshaven-HammGotha-Hannover region, and back from there.

Because of the lessons of the PFET, and the use of the 'every body drop-tanks-at-once' rule in less sophisticated circles, the Me109 pretty well must strike in one big attack. It is strongly urged that tanks be kept on as long as possible, to give the German forces one or two, extra turns of attack.

The staging rules do allow the German to clump his forces together. However, it is strongly urged that the German player do not use this rule:

- 1) Rule 4 makes any tactical operations in a staging area difficult. Staging can be tricky at best, and disastrous if US fighters are coming.
- 2) Staged airfields just beg a bombing or strafing attack. All it would require would be one oversight, and the Luftwaffe would take it in the chops.
- 3) It's not necessary. There are so many airfields in north-central Germany that large numbers of fighters can be posted 2 factors per base and still be able to hit nearby bombers with most or all groups in the area. Fighters can attack on the turn they take off, which makes bomber groups fair game for anybody in a six hex radius.

Me163 E rtg G A rtg 0.249 Fuel 0

The disadvantages of the Me163 are comparable to the Me262, it's chained to its own base, it can't stay up and fight anything outside its four hex range, and what's more, it can be bypassed if it's not in the middle of a major bomber route, e.g., if it's based in southern Poland. Combined with rotten hitting power, this aircraft has few advantages.

About the only real advantage it has is that it can hit and hit and hit anyone flying through its immediate area, mainly slow bomber forces. Based in the middle of a cluster of targets, it can eventually inflict a lot of casualties, especially because it is immune to bomber fire.

It is strongly urged that the Komet be used to cover a major target complex, remote from the R line. Brandenburg and Juterbog, on the approaches to the Berlin area, are ideal Komet bases.

He162 E rtg 6 A rtg 0.249 Fuel 1

A combination of short range, comparable A rating and similar characteristics make the Salamander quite similar to the Komet. Other than its E rating and the fact that it doesn't land on the same turn it takes off, the He 162 can be thought of as a Komet with a nine hex radius of action, with all the attendant problems.

Like the Me262, though, the He162 can cover other interceptors in its area with its E rating. Care must be taken, however, to keep it out of reach of Allied fighters.

Me110 E rtg 2 A rtg 0.417 Fuel 9/4

The ratings of the Me110 show its main uses: it can be effectively used against bombers, and is equally poor against

Allied fighters, the chief plus of the Me110 is Range, and it can operate in areas with few airfields. So, it can be consigned to such regions as Austria and the Baltic with good reason, unless there's a major sweep the main opposition will be bombers. And, as long as the Me110s keep their tanks, they can stay with the enemy formations, and attack continually.

Ju88 E rtg 0/-Is A rtg .341 Fuel 10/8

This aircraft can be posted in the south with the Me110 and Me410 fighters, but can be sent to the Baltic and Eastern Front without much trouble, as the E rating and A rating are poor by German standards. It should not be used, say, in the West, where large escorts (E ratings) and fighter sweeps are to be expected, as the 88 is in little position to hit back.

Ta152 E rig 5 A rtg 0.167 Fuel 3

Its large E rating and great speed make this aircraft similar to the jets, in that it is useful mainly for its E rating as top cover. It is too few in number to count for much else. It should be employed somewhere in Germany, exactly where doesn't matter all that much.

Me410 E rig 2 A rtg 0.598 Fuel 11

By LUFTWAFFE standards, the Me410 is the deadliest aircraft in the game. Everything said about the Me110 goes, doubly so, for the Me410. Although atrocious against Allied fighters, and shouldn't be risked that way, the Me410 is hell on wheels in a bomber formation, and its range allows it to "escort" bomber formations quite a ways.

The410 should be sent to Austria. It really won't add much to north German defenses and might get in the way of 109s; the main thing is, if it isn't guarding the south, what else will do the job as well? Considering the few airfields, no other aircraft can.

Do217/He219 E rtg 2 A rtg 0.451 Fuel 14-7

These two aircraft are also at their best in remote areas. The single Do217 can cover the Russian and eastern Baltic sectors quite well; with the later He219s it can help cover the Baltic, Russian, and southern fronts. The He219, with an endurance of 7, should go where there are at least a few airfields, e.g., Austria,

De520 E rtg 2 A rtg 0.143 Fuel 8/5

What is said about this aircraft goes for all school units. Although it would be a waste to withhold them in the face of the need for all available forces, the German player must consider the rules: if the school units are to be converted into jet units on a 1-1 basis, they must have not taken casualties. (However, there is a loophole; the rules specify two units for one jet unit. Two one factor units will do nicely, helping to recoup some of the loss).

If employed, the school units should be limited to the Baltic and the East, to limit the chance of losses. Even if they have taken losses, they should still be kept back there; rebuilding school units is a waste of scarce replacement factors that can better be used to rebuild Fw190s.

P51 E rtg 4 A rtg 0.362 Fuel 14/5

P47 E rtg 3 A rtg 0.492 Fuel 10/3

These aircraft are often assigned mistakenly to escort duty. One or two on escort to provide a covering E rating is OK, but assigning many or all of them is a supreme waste. These fighters, by virtue of their speed, numbers, and effectiveness, should actively hunt the enemy. Each German factor they shoot down is one less that can take out the bombers-and each bomber unit is one more city taken out. Further, chasing the Luftwaffe out of their airfields, or launching pre-emptive strikes at aircraft based 7 hexes or less from the R line, will disorganize them, and delay their attack on the bombers.

The Thunderbolt is good for most tactical purposes. It's the deadliest USAAF aircraft, and its speed and E rating is enough for most German fighters. Its drawback is range, if it expects to fight with full E rating it must keep within basic range of the R line, 21 hexes or less.

Its partner, the P51, can reach much further into the German heartland. Although not as hard hitting, large numbers can make up for it. It is strongly suggested that no less than 8 groups of P51s try going it alone. The initial 4 aren't all that strong.

Remember one thing; these aircraft can be replaced easier than their German counterparts.

Spitfire E rtg 3 A rtg 0.15 Fuel 6/2

Because of its range problems, the Spitfire is really not suited for escort duties, but it can be employed with some reason, as its E rating offers some uses; besides, its speed and range makes its employment with its partner P47s difficult. Still, this fighter has enough going for it that it can be used either way; also, one group really won't have too much importance in a mass of fighters. If its E rating mitigates an attack on a bomber force, then it's been of some use.

P-40 E rtg 2 A rtg .195 Fuel 10/5

P-39 E rtg 0 A rtg .083 Fuel 6/4

P-38 E rtg 2 A rtg .247 Fuel 14/6

All three of these fighters are useful for little other than escort duties. The P40 and P39 certainly can't match German fighters, and the P38 might have use as a tactical fighter only against German twin-engine aircraft. Even then, the Germans have the advantages in range (locality included) and numbers. Its better that the P38 losses be taken instead of bombers, hence the need to keep them on escort. About the P40 and P39, the less said the better.

B-17, B-24, B-26

A-20, A-26, B-25

These aircraft are something of an anomaly. Limited mostly to the Advanced Game, they have no firepower, so there is no need for them to move in formation. Excluded by the rules from other bomber formations, they are pretty well on their own.

Their main effectiveness in the game is in the absence of opposition. For peripheral raids: Hungary, Austria, isolated targets away from main bomber routes, targets close to the current R line these are their main targets.

The faster bombers, the A-type bombers, also have uses in pre-emptive strikes on airfields. This is of only limited use,

the German is apt to shoot them down first if he feels in the mood, and even if the bombers do take out an airfield the German will seldom be fooled twice. There's only one airfield on the map that is, even without aircraft, worth bombing, Zeltweg, Austria, the rest are too numerous, and the USAAF needs to take out every target he can, with the victory conditions being so tight.

ANALYSIS AND TACTICAL' EMPLOYMENT BOMBER TACTICS

We all know the basic strategy of USAAF bomber employment, as suggested to us by history and that is, of course, clumping the bombers into enormous formations and making the Hun pay dearly for attempts on them. What may not be as well understood is the measures and counter measures of organized bomber warfare on the LIV board.

The PFET demonstrated the lesson of numbers; the greater the number of bombers, the more interceptors they'll knock down, collectively and individually. This limits bomber groups to three-five groups: B17s, B24s, B26s, and a group or two operating on other fronts,

The best practice, by consensus, is to keep the bombers together as long as possible, then release individual groups as the targets draw near-the optimum being releasing all bombers within a turn of their targets. The map shows several attacks, and the problems involved. (See Chart 2J)

The sample attacks in north Germany, involving 12 B24 groups and 5 B17s on a sneak raid (appearing 5 turns after the B24s), illustrate this strategy. The final B24 target, Ruhland, is 8 turns from the R line by straight-line distance; since the route chosen takes exactly 8 turns it is legal. The bomber group releases groups on turns 4, 5, 6, and 7 (unloading one on Hannover on turn 4, then scattering groups outward and forward, at the points marked by arrows). In effect, the formation becomes an omnibus of destruction, dropping individual groups off along the way.

The three southern attacks shown are all improper. The rules clearly indicate that detours must not add to the time-in-air between R line and target. The B 17 group headed for Stuttgart goes so far east of Munich that the group going there will have been 5 turns out from Italy instead of 4. The B26 attack on Ingolstadt and Regensburg is illegal the Regensburg plant is 4 turns from Italy, but so is Ingolstadt, the group headed there would have had to go via Salzburg. Further, the attack on the Linz-Steyr area is legal, but just barely: Steyr is 3 turns away, so the group assigned there has to break formation that turn near Zeltweg, whereas the Linz group can stay with the main group another full turn, and then turn sharply right, Linz is 4 turns away either way.

The left wing of the B24 attack is quite illegal. Pardubice is 7 turns away from Italy, so that's OK, but the group reaching Prague is a turn late. But: other than the actual strike on Prague, it's a good and legal attack. If the Luftwaffe is caught unaware the whole German southern flank could be burnt out in one quarter.

One note on target priorities, beyond what I wrote in "Luftwaffe Organized" in the December 1973 issue of the GENERAL: The targets marked out on the map in the Hannover, Leipzig area not only constitute the bulk of your

targets as the US player, but are the center of the German defense. Burn it out in early or mid-1944 (if you can bring it off), and you will not only have crippled the German aircraft and oil industries, but you'll have torn out the heart of the German defense. The German player will be forced to defend the outer targets that much more at a disadvantage.

Escorting is a major part of bomber operations, whether or not to, and if so, how much and of what units. Escort serves two basic purposes; it gives the bomber force an E factor of sorts, as the Germans have to hit at the escort first; and, the escort force absorbs what otherwise would be bomber casualties.

We already discussed escort problems from the fighters' view. Escorts for a bomber are not necessarily a good thing, as their effectiveness in the face of large groups of German fighters are limited at best-and, may even strip cooperating fighter forces of a countermeasure. Close escort is not the only way to get the bombers through, as the Germans learned, too late, at the Battle of Britain. Aggressive P47 and P51 sweeps can do the job just as well.

Often neglected are escorts for the medium and light bombers. Lone A20s and B25s might not need escorts, if they aren't going anywhere important, but the US player should consider assigning P38 or P40 escorts, or the sole P39, to the B26s, which are somewhat numerous and can make the difference if they get through. Usually they don't even against indifferent German opposition. But an escort group or two could mean, as much as five extra targets to the USAAF, or force the Germans to use disproportionate forces to stop it from occurring.

THE PROBLEM OF BALANCE

In both the Advanced and Tournament versions of the game, the USAAF is faced with stringent victory conditions. In the Advanced Game, the USAAF must take out every target on the map, all 79 of them, in the face of increasingly strong German fighter opposition. The Tournament Game, the less involved version of the campaign type part of LUFTWAFPE only requires the destruction of 43 German aircraft plants, with diminished US forces.

In either game, the US is hard-put to achieve his objective, despite his numerical and replacement strengths. Further, no allowances are made under standard rules for, German fuel problems or advancing Russian forces, the latter leading one to the nasty conclusion that the USAAF player's objectives is not to help the Western Alliance win the war, but to smash targets before the Soviets can get to them, in effect, a gigantic Demolition Derby. In fact, historically-minded players may note that they are, in the last two or three quarters of the game, bombing targets in Soviet hands, historically.

Technically, the game is balanced; very, very delicately balanced. But, since the obligation of attack is on the US, bad luck or a single bad quarter will do him in. Considering the amount of effort required for a full Tournament or Advanced Game, quite tragic. Being beaten by a good opponent is one thing, losing to the game quite another.

The Optional Games section proposes a number of variants to balance things out. Basically, this means that the US attempts to pull chits marked with some industry. Once the

targets of that industry are all taken out, the Luftwaffe is grounded, whether the industry is oil, armaments, ball bearings, or wing nuts. Ignoring the generalized effects, it must be said that the game's standard target system, eliminate the target with all its industries at once, is as close as anyone could come. The Combined Bomber Offensive, besides its problems with the new science of target intelligence (what effect does the target have on the German industry?), had to follow the whims of the Allied high command. The result was a lot of side trips for secondary or political purposes, e.g., the attacks on sub pens, V-weapons, terror missions, etc. Besides, even when key industries were badly-hit, the Germans often came up with something to replace it, from ersatz chocolate and soap, to ersatz fuel (synthetic oil), and even ersatz planes (the Salamander).

Thus, the problem of balance: how do we balance the game without unhinging it, rendering it altogether unplayable, or putting in a historical atrocity?

For example: a lot of the woes of the game stem from the Aerial Combat Table. Just look at it! On some of the larger (and more crucial) battles, the ACT has results ranging from 4 to 20 or 25. That's as much as 75-100% above and below the average. Considering that 20-odd factors on the attack represent a large part of that quarter's forces at any given time, the results of a few bad die rolls can be fatal. Maybe the wing commander got up on the wrong side of the bed that morning—that's great history but lousy game playing

Computer analysis again provides the answer. Chart 3—the Standard Results Chart, shows the average results for any given attack on the ACT, rounded to the nearest .001. This can very easily be implemented into the game, in two forms:

- (1) Those who still want a smoothly playable game, with no record-keeping, can do so. Merely round off the results shown, rounding anything below .499 down to the nearest factor (1.0), and rounding anything at or above .500 up.
- (2) History buffs, misanthropic wargamers, and CPAs can elect to implement the full result, down to the last thousandth. They can either:
 - A. Remove the unit as above, but keep a running total of the losses for each type, and alter the replacement accordingly, building up new units out of fragments of the old ones.
 - B. Retain the unit as long as it has .001 or more, keeping records on each group's losses; when units enter combat, round the unit's factor off and keep it on the ACT within manageability.
 - C. Retain the unit to the last .001, and recompute its attack value accordingly, and exactly to the last .001. An attack of more than two units will require the use of a Hewlett-Packard H-35 and the Caltech Department of Mathematics.

That is what we get into with average results in the abstract. I offer (1) above as a plausible means of averaging results; (2) is not too strongly recommended for everyday wargaming.

Now and then the problem of E ratings will arise. A fighter with an inferior E rating subtracts that rating from a superior defending fighter (E ratings not considered when the attacker

is equal to or superior to the defending fighter's E rating). That amount is subtracted from the die roll. This can sometimes involve even more luck on the die rolling (example: 20 factors of P47s attack 2 factors of Ta152. Subtract the P47s factor of 3 from the Ta152s 5, and you subtract 2 from the die roll. If the US player rolls a one or two, that's all she wrote the Ta152 gets away scot-free.

This can be implemented, and fairly, onto the Standard Results Table. If you run into a situation where you have an inferior fighter attacking something with a larger E factor, and you want to have average results, use the following formula:

$$X = A - A(e/6) \text{ where}$$

e = defender's E rating - attacker's E rating

A = average results, according to SRT, for that attack

This will give you true average results after the E rating differential has been extracted from the 6 possibilities, as expressed in the SRT. It's not as difficult as it looks.

RUSSIAN GAMBIT

Another means of balance can be found by using the Russian Gambit. This assumes that the USAAF player is merely out to win the war, and not merely to score off the Kremlin or the Armed Services Committee. The Russian gambit is as follows:

Remove the following cities from the target list, crediting them to the USAAF player:

- ❖ end of Oct '44 quarter: Warsaw.
- ❖ end of Jan '45 quarter: Marienburg, Pozan Liegnitz, Breslau, Diosgyor.
- ❖ end of Apr '45 quarter: Anklam, Peenemunde, Oranienburg, Berlin, Erkner, Ruhland, Sorau, Pardubice, Bratislava, Budapest, Brandenburg,
- ❖ Fighter Bases:
 - Germans may not use bases east of line Bergen, Peenemunde, Sorau, Diosgyor in 1945 quarters.
 - Germans may not use fighter bases on or west of line running through Friedrichshaven, Stuttgart, Aschaffenburg, Osnabruck, Wangerrooge in 1945 quarters.

This is, of course, assuming historical results on ground, which was not too affected by bombings of war industries, but was quite affected by the absence of German airpower, called home to defend Germany.

The Advanced Game allows the Germans to get away with murder, allowing him Me262s as early as Jan '44. Besides the problems in developing the turbojet-and rocket engines—the Me262 'in particular could not be developed early because of Hitler's interference. As a result, it and the Me163 should not appear in anything other than what is shown on the Order of Battle.

The game can be balanced toward the German somewhat, and then I wonder, by allowing him to build the He162 in 1944. Considering the problems of the Salamander, allowing the German to form a LuftVolkssturm of Salamanders when he should have a proper air force can be dubious for the German cause. Let's just say that a US player can offer Salamanders to

his opponent in good conscience, but nothing else. Besides, if the German wants Salamanders, he'll get what he deserves.

ENERGY RULES

Since the October War of 1973, we have been painfully learning the effects of petroleum shortages on a peacetime economy. Thirty years ago Germany and Japan learned what it could do to a concerted war effort.

Much of World War II was fought over raw materials and energy sources, particularly in southern Europe, Russia, and the East Indies. The two Axis powers struck out with this very much in mind, Japan southwards to the Indies, Hitler eastward toward Rumania and the Caucasus, and southeast then, toward Egypt and Iraq, aiming at the Persian Gulf, among other things.

The two Axis powers suffered particularly when their oil supplies were cut-Japan ran short when the Indies oil was interrupted by the loss of the Philippines; Germany felt the pinch when the Rumanian oil fields were bombed and the Caucasus slipped out of reach. Germany was partially able to beat the shortage with synthetic fuels, and was able to fight on for a while. But, with the USAAF closing in on the refineries, the Luftwaffe became increasingly earthbound.

We cannot expect the Luftwaffe, in the game, to fight into 1945 without having to consider fuel in addition to losses. The German's game forces, as in real life, are at their largest towards the end. But German resistance, except maybe for the jets, became increasingly feeble in the last months. So should it be in the game, for besides the obvious difficulties the German should have in getting fuel in a nation gutted by bombing, with few oil reserves to begin with-there is the fact that the USAAF has an inherent handicap, as the 1945 quarters usually see the largest German force, while the American player has to get the last targets that mean the difference between victory and defeat.

These ENERGY RULES can be incorporated accordingly:

- (1) Each refinery (Oil target) produces 10 units of fuel per quarter. Each chemical plant produces 15 units per quarter (that's not the actual proportion of fuel they turned out, but the chemicals they made were vital in synthesizing fuel). Production drops to 0 at each facility bombed. (Fuel on hand each quarter is computed at the start of each quarter).
- (2) Fuel stocks cannot be accumulated from quarter to quarter. Unused reserves will be taken by the Wehrmacht, Kriegsmarine, and other Luftwaffe contingents.
- (3) Each flight of a unit (regardless of time-in-air) consumes 1 unit of fuel. Each He162 or Me262 unit consumes 1/2 unit per sortie (they used a crude diesel fuel rather than the high-octane aviation gas); the Me163 in the standard game use 0 units. (Rocket systems did not use petroleum fuels, nor did they consume that much of the German chemical industry's output.)
- (4) German players may freely substitute He162s for new units, starting January 1944, up to a total of 13 extra He162 groups (other than JGI).

- (5) The Germans may freely substitute Me163s for new units, starting January 1945, up to a total of 2 extra Me163 groups (other than JG400).
- (6) German replacement factors cannot be used to produce jet or rocket units except for jet/ rocket units already in the dead pile.

BIBLIOGRAPHY:

- ❖ COMBAT AIRCRAFT OF THE WORLD, John W.R. Taylor ed.
- ❖ AIRCRAFT OF WORLD WAR II, Kenneth Munson ME109, Martin Caidin
- ❖ SPITFIRE, John Vader
- ❖ ROCKET FIGHTER, Wm. Green
- ❖ FLYING FORTS, Martin Caidin
- ❖ FLYING FORTRESS, Jablonski