Air Warriors

Volume II

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SPECIAL EDITION

FOREWORD

"Air Warriors" Volume II is a collection of feature articles spanning history from the primitive beginnings of air power to the supersonic aircraft of today and beyond. From aviation pioneers and wing walkers to sophisticated F-15 pilots and astronauts, aviation has dramatically influenced the course of modern history. These series of stories will tell you how.

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Flight Comes of Age

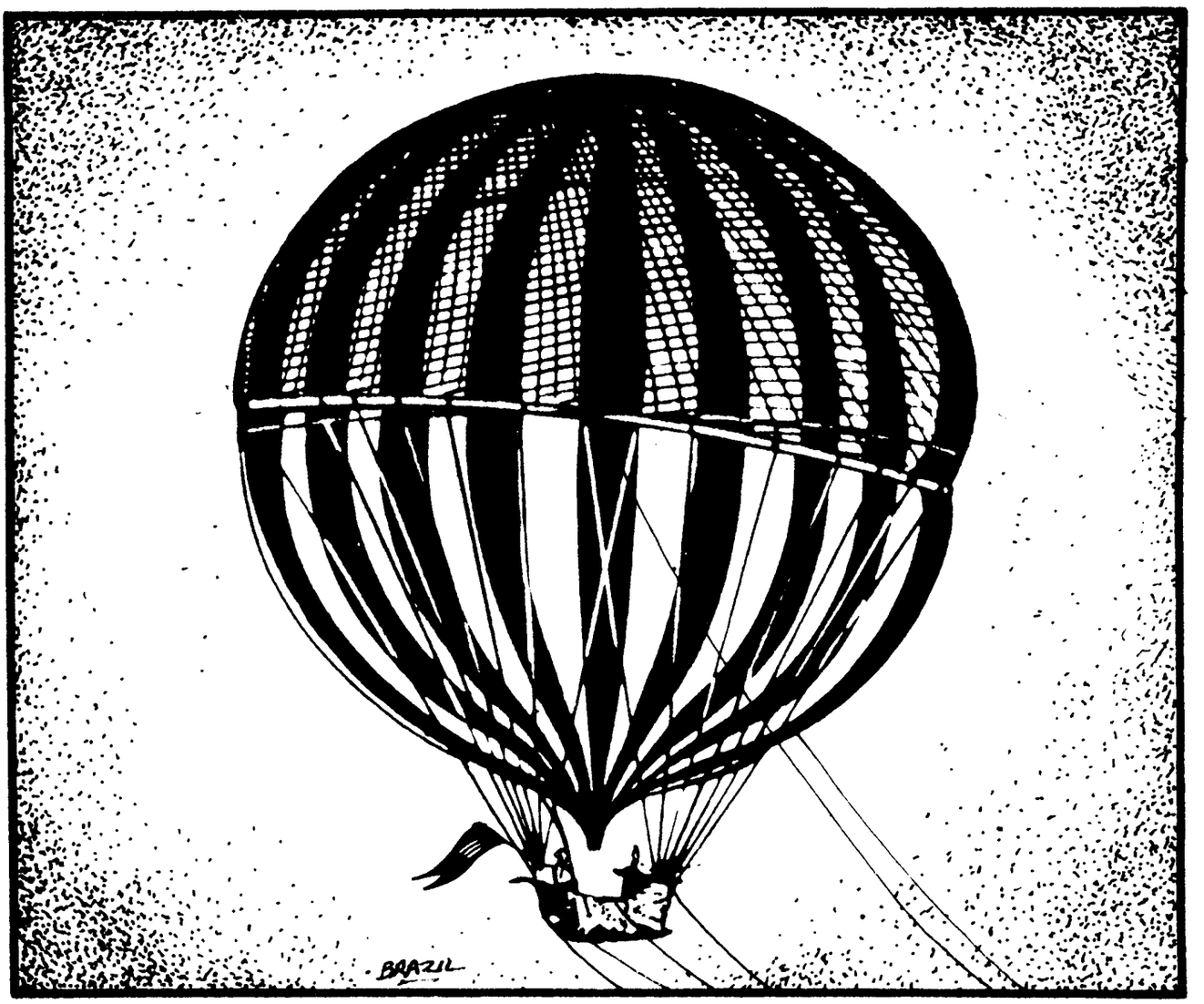
World War I

World War II

Korea

Vietnam

The Future



Dream of flight flourishes

What do a duck, a sheep and a rooster have in common with a fighter pilot and a space shuttle astronaut?

On Sept. 19, 1783, at Versailles, France, the duck, sheep and rooster became the first living beings to leave the surface of the earth in a man-made flying device.

As King Louis XVI looked on, the brothers Jacques and Joseph Montgolfier filled a 35-foot paper-lined cloth bag with hot, smoky air. The balloon lifted off, carrying the three animals in a wicker basket.

Eight minutes later, the balloon returned to earth, and plans were immediately made to send up a man.

...although failure, poverty and death plague first inventors.

The king offered a condemned prisoner as the first passenger, but his historian, Jean Francois Pilatre de Rozier, argued it would be an honor to make the flight and asked permission to go.

The Montgolfiers set to work, and in less than a month, the second balloon was ready. It had a basket large enough to hold a man, a fire pan, some damp straw for burning, and a bucket of water and sponges for fire extinguishing.

On Oct. 15, 1783, Pilatre de Rozier became the first human to fly. The balloon, tethered by a long rope, soared to the lofty altitude of 80 feet on its 4½-minute flight.

In November, Pilatre de Rozier, accompanied by the Marquis d' Arlandes, made an untethered flight which lasted 25 minutes. The two men reached 300 feet, and were

...world's first aeronaut had also become the world's first flying fatality.

carried over a large portion of Paris.

Another Frenchman, Jacques A. C. Charles, had already sent up test balloons made of silk cloth coated with rubber. The balloons were filled with hydrogen.

Jacques and Joseph Montgolfier had also wanted to use hydrogen but the paper-manufacturing brothers were unable to effectively seal their paper-lined cloth balloons. The hydrogen--known then as "inflammable air"--kept leaking out.

Successful solution

Monsieur Charles, working with brothers Aine and Cadet Robert, solved the problem. On Dec. 1, 1783, just two months after Pilatre de Rozier's 80-foot tethered flight, Charles and the Roberts climbed into an extravagantly-shaped wicker basket covered with painted cloth and decorations. It was suspended beneath a 27-foot hydrogen balloon.

Equipment--including a thermometer and a mercury barometer--warm clothing and provisions were loaded into the balloon. The two men began tossing out ballast, until the balloon was precisely balanced. A five-foot green test balloon was released to indicate wind speed and direction.

Then, with Joseph Montgolfier looking on, the men threw out 19 pounds of ballast and the balloon slowly rose from the Tuileries Gardens of Paris.

High flight

In just a few moments the balloon reached 1,800 feet. Two hours and 27 miles later, the balloon touched down on the plain of Nesles.

Although the sun had set, Charles was so exhilarated he decided to go up once more. Alone this time. He climbed back in, the basket was released and the balloon shot skyward at an alarming pace.

Charles later boasted he was the first man to see the sun set twice in the same day. His balloon stabilized at about 10,000 feet, where acute pain in his right ear and jaw, coupled with extreme cold, forced him to decend. His solo flight lasted 35 minutes. It was his first and last.

Ornate decorations characterized the first hydrogen balloon.

Many believe his meteoric rise to a previously unheard-of altitude scared him so badly that he no longer wished to fly.

The world's first flight by a woman is an honor split four ways. The Marchioness de Montalembert, the Countess de Montalembert, the Countess de Podenas and Mademoiselle de Lagarde all made a tethered flight in a Montgolfier balloon in Paris on May 20, 1784.

The first free flight by a woman was made by Madame Thible. Accompanied by a Monsieur Fleurant, she flew to an altitude of 8,500 feet over Lyons on June 4, 1784.

Jean-Pierre Blanchard used a hydrogen balloon Jan. 7, 1785, to fly from Dover, England, to Guisnes, France. This trip marked the first international balloon flight and the first English Channel crossing.

Intense competition

Stung, Pilatre de Rozier and the Montgolfier brothers began preparing their own channel-crossing balloon. They built a combination craft--a 33-foot hydrogen balloon on top of a cylindrical hot-air balloon 24 feet high by 12 feet in diameter.

On June 15, 1785, Pilatre de Rozier and Jules Romain took off in the hybrid from Boulogne, France. About 5,000 feet up, the balloon began drifting back over land, then fire and smoke could be seen by spectators on the ground.

The wreckage of the balloon suddenly fell to earth. Workmen rushed to the spot and lifted the burnt and crumpled silk. Pilatre de Rozier had died on impact. Romain was still alive, but died moments later.

First death

The world's first aeronaut had also become the world's first flying fatality. It was a setback, but the dream of flight still lived on.

Incidentally, Blanchard made the first successful balloon flight in the United States--from Philadelphia to New Jersey--in 1793. George Washington and other dignitaries were on hand for that launching.

The Montgolfiers turned out to be better designers than businessmen. As owners of a paper factory, they eventually had to be rescued from poverty by government pensions.

First air force serves infantry as observers

The military potential of aeronautics was explored from the earliest years. Using the balloon for aerial reconnaissance was an obvious tactic.

Late in 1793, when the French were battling the Austrians, two French scientists, Charles Coutelle and N. J. Conte, developed a method of generating hydrogen without using sulphuric acid. This was important because all available sulphur was needed for making gunpowder.

They succeeded, by passing steam over a red-hot iron, and were given the go-ahead to build an observation balloon at Chalais-Meudon just outside of Paris.

Here, the first military observation balloon, L'Entrepenant, came into being. The balloon and net were made extra-strong to withstand the buffeting of the winds. Two cables were attached to lend stability and to keep from losing the balloon if one cable was severed by gunfire. A two-man basket was suspended beneath.

After a demonstration, the world's first air force was formed, the Aerostatic Corps of the Artillery Service.

Both Coutelle and Conte were made brevet-captains. Coutelle was designated field commander while Conte stayed in the rear to build new balloons and train recruits.

The first air force consisted of the two brevet-captains, a lieutenant and sub-lieutenant, a sergeant-major, four NCOs, 25 enlisted men and a drummer boy. They wore blue uniforms with red braid, black collars and facings. Their buttons were embossed with a balloon and the words "Aerostier." Only the officers flew, while the others made up the ground crew.

After fighting as infantry at Maubeuge, France, until the balloon was delivered, the corps sent up Coutelle at the end of a 1,770-foot rope. He was able to report the Austrian and Dutch troop positions by dropping messages down the cable in weighted pouches.

The fifth time Coutelle went up, the Austrians introduced anti-aircraft artillery. One 17-pound ball passed over the top of the balloon. The next grazed the bottom of the basket. Coutelle then directed the ground crew to let out more cable, which carried him out of range.

When Napoleon came to power in 1798 however, he abandoned the balloons and the corps.

Historians feel Napoleon's primary errors in the Battle of Waterloo, in 1815, could have been corrected by a balloonist who could report on the terrain and enemy movements.

Flight off to a slow start

First parachute real head spinner

From a military point of view, mankind's first 70 years or so of flight brought many fine ideas and very little carry-through.

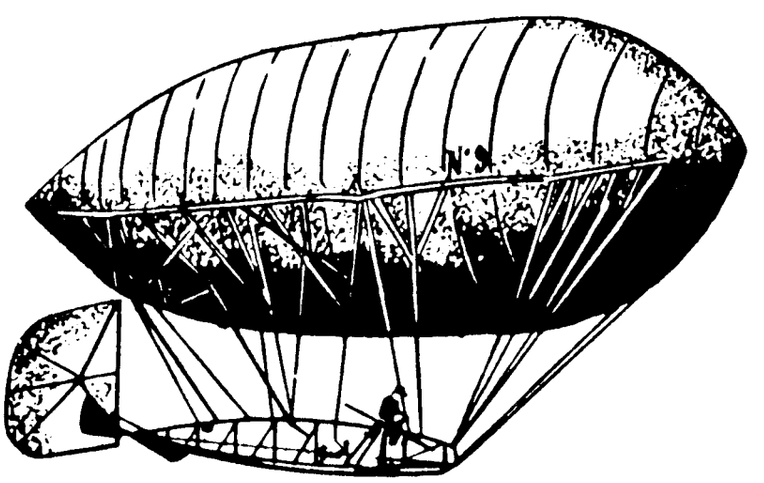
Ben Franklin proposed using balloons for airborne observation posts. That eventually happened. He also came up with the idea of "vertical envelopment" of an enemy's forces. That idea, using parachutes rather than the balloons Franklin proposed, finally became reality in the 1930s with Hitler's Fallschirmjaeger parachute corps.

A French Corps of Engineers officer named Jean Baptiste Meusnier designed a dirigible in 1784. He gave the design to France's Academy of Sciences, went off to war and died as a general fighting the Prussians in 1793.

The idea died in the academy.

However, the decendents of the Prussians used dirigibles in World War I to bomb targets on France and England.

Modern aerial bombardment conjures up an image of huge aircraft dropping seemingly endless streams of bombs against a target.



Frenchman designs dirigible ... idea dies

Prison escape spawns parachute...

However, the first aerial bombardment was a big flop.

It happened in June 1849 at the siege of Venice, Italy, during the revolution against the Austrian empire. Austrian forces constructed 200 small hot-air balloons, known as Montgolfieres, and equipped them with bombs weighing 25 to 30 pounds. The release mechanism was hooked to a time fuse.

A seemingly favorable wind came up. The Austrians inflated their balloons, lit their fuses and released them to drop the bombs on the

Then, the wind changed. Many of the bombs fell back on the Austrian army. The few that did carry into the city did negligible damage, at best.

The discouraged Austrians went back to conventional methods of warfare and the concept of aerial bombardment languished until the days of fixed-wing aircraft.

Another idea which is now commonplace in military forces is parachuting. However, when it was first introduced, it lasted but a brief period -- for good reason.

The first human parachutist to jump from an aerial platform was a Frenchman, Andres Jacques Garnerin.

Having heard of experiments dropping animals by parachute from balloons, and knowing of Sebestian de Normand's jump with a 14-foot parachute from the Montpellier Observatory's tower in 1783, he resolved to make his own parachute.

He had good reasons. A prisoner of war, he was in the fortress of Buda, Hungary, at the time. Unfortunately, his idea came to naught, but after getting his freedom, he resolved to carry on.

On Oct. 22, 1789, he ascended under a hydrogen balloon from Paris's Monceau Park. He stood in a narrow wicker basket attached to his furled parachute. At 3,000 feet, he cut the suspension line.

The 30-foot parachute, made of impervious canvas and shaped like an open umbrella, functioned as designed. Unfortunately, the design wasn't too good.

Since the parachute was impermeable to air and he had no center hole to spill air, it oscillated wildly. Poor Garnerin had to hold on for dear life to keep from being thrown out. He landed roughly on the plain of Monceau, mounted a horse and rode back to the park in triumph.

He later cut a hole in the top of the parachute, at the advice of scientists, and made many more parachute drops. His example was followed by others, and parachuting flourished briefly.

However, by the time Garnerin died in 1823, parachuting was essentially a carnival stunt, and more or less died out.

It finally resurfaced during World War I as a way for aviators to save their lives.

Flying marvel never leaves earth

Sir George Cayley was only a 10-year-old in Yorkshire, England, when something momentous happened in France.

When he heard of Jean Francois Pilatre de Rozier's first manned flight in a Montgolfier brothers' balloon, the young boy's imagination caught fire.

That was in 1783. Before he died at the age of 84 in 1857, the scholarly baronet had covered more ground in aeronautical research than perhaps any other individual in history.

Many firsts

By 1799, he had designed the first modern fixed-wing airplane, complete with control surfaces on the tail and propeller. In 1804, he built a five-foot model glider -- the first fixed-wing aircraft in history.

In 1809, Sir George published articles about aerodynamics. All subsequent research in aerodynamics stems from these few articles which spell out things like lift, thrust, streamlining, control in pitch and yaw, and automatic stability over three axes.

Perhaps his greatest first came about in 1853. Sir George built a fullsize glider. At the time he was 80 years old and too frail to fly it, so he ordered his coachman to do so.

Coaxing a coachman

The coachman strapped in, began running downhill and then, the laws of aerodynamics followed their natural course. The glider lifted the coachman off the ground and carried him about 200 yards across a valley. He landed safely.

However, when the jubilant Cayley asked the coachman to repeat his flight, the terrified man obstinately refused. The disappointed Sir George continued his experiments until his death, reportly having a 10-year-old boy fly the glider at least once, and several mentions of towed flights are recorded.

Among Sir George's other aeronautical design firsts were biplanes and triplanes; the internal combustion engine for aircraft (powered by gunpowder); jet-propelled aircraft; a convertiplane which would rise like a helicopter on four propellers and then fly forward using two more; winged artillery missiles and a lightweight undercarriage wheel for aircraft.

Kindred spirits

Sir George and Leonardo da Vinci would have been kindred spirits, had they known each other. However, these two giants of invention did share one poignant reality.

Despite all their pioneering in aeronautical and aerodynamic design, neither man ever flew.

Balloons inspire conquest of skies

Before the first flight by a human in 1783, the unknown part of the atmosphere began 10 feet higher than a man could jump.

The balloon changed all that.

Now, mankind knew there were two limits between the earth and the stars, one was gravity. The other was that unknown altitude at which a balloon would pop if some of its hydrogen was not bled off.

In 1862, two Englishmen, James Glaisher and Henry Coxwell, determined the hard way that there was a third limit.

The pair of scientists lifted off from Wolverhampton, England, at 1 p.m., Sept. 5, under a 60,000 cubic-foot balloon, the Mammoth. An hour-and-fifty-minutes later, the balloon reached the height of five miles, and the scientists discharged some ballast.

Glaisher noted that Coxwell had been having difficulty breathing for several minutes. Moments later, Glaisher noticed he was having difficulty himself when he couldn't read his instruments.

Desperate, he had taken the cord in his teeth and jerked his head sideways. It worked...

Glaisher laid his arm across a table to steady himself. When he tried to move it a minute later, it wouldn't move.

Neither would the other arm. He tried to shake himself and fell over against the side and bottom of the balloon.

He tried to speak. He couldn't. Then, his vision went black. Minutes later, he was unconscious.

Glaisher was awakened by Coxwell talking to him. Coxwell said when he'd seen Glaisher fall, he'd tried to reach him but couldn't. His own hands were turning black and had become useless.

The groggy Glaisher noticed the balloon was descending. Coxwell said that after trying to reach Glaisher, he tried to reach the cord to the relief valve, but his hands wouldn't grasp it.

Desperate, he had taken the cord in his teeth and jerked his head sideways. It worked and the balloon started to descend.

By the time they finally landed, Glaisher had recovered so well he walked seven miles to a nearby town to arrange a cart to retrieve the balloon.

The two had reached 30,000 feet without oxygen equipment. Their record stood for 32 years, until Germans Artur Berson and Prof. Reinhard Suring reached that altitude in 1894 using a larger balloon and supplemental oxygen.

...but total domination was just out of reach

They still suffered too much from their limitations to be useful.

Balloon exploration of the atmosphere and the world was widespread throughout the second half of the 19th century. But it had its limitations. Balloons could go up and down, but the control of the lateral-direction travel depended solely on the winds.

There were a few experiments to change this.

In 1852, clad respectably in top hat and frock coat, French aeronaut Henri Giffard managed to amaze the people of Paris.

He lifted off from the Paris Hippodrome under an elongated balloon. Sharing the balloon's car with him were a 350-pound engine and 500 pounds of water and combustible fuel.

The five-horsepower steam engine turned a three-blade, 11 foot propeller at about 110 revolutions per minute. Steering was done with a triangular sail on a pole serving as a rudder.

Trailing exhaust steam, Giffard flew to Trappe, 17 miles away, and landed. On another occasion, he demonstrated that he was in control of the direction by flying his balloon in a circle.

The balloon and early dirigible flights were remarkable achievements, and were an inspiration to future aeronauts. But, they still suffered too much from their limitations to be useful.

The conquest of the skies, the taming of the atmosphere to humanity's everyday use, was in the offing. The tool which would finally dominate the sky was tantalizingly just out of reach—a couple of years into the 20th century.

Combat Airlift

It doesn't require a plane

Combat airlift. The phrase conjures up visions of fat-bellied transports discharging troops on runways in faraway places.

In France in 1870, combat airlift was simple. It consisted of cheap gasbags of varnished calico cloth -- built by the Paris Post Office.

During the siege of Paris in the Franco-Prussian War, these cheap cotton balloons were used to maintain communications with the outside world and the provisional government at Tours, France.

Balloonist Jules Duruof made the first flight from the besieged city Sept. 23, carrying 227 pounds of mail. During his 70-mile flight, he taunted the Prussians -- from well above range of their guns -- by dropping calling cards on their positions.

Getting mail out was one thing. Getting communications back in was another. The solution was homing pigeons.

City saved

Paris's professional balloonists began carrying pigeons on their one-way flights out of the city. The birds were then fitted with capsules containing microfilms, and released to return to the city. Five dogs were also used, but they all failed to return.

Altogether, 66 balloons flew out of Paris during the siege. Eight of those either landed in enemy territory or the Atlantic Ocean. The others carried out 102 passengers, more than 400 pigeons and about 10 tons of mail. The siege ended in January 1871, and the first combat airlift was over.

Due to the advent of a new cannon for anti-balloon use, flights were later restricted to nighttime.

As the supply of balloons ran out, the Post Office began building them at two railway terminals in the city. Since they were only designed for one-way travel, the balloons were built cheaply and simply.

Slight setback

On the other side of the Atlantic, the United States Army completely ceased balloon operations in 1863. But, in 1891, Brig. Gen. Adolphus Greely, chief of the Signal Corps, asked for money to develop a balloon corps. His request was approved and a balloon section was established in 1892.

Balloons save beseiged city and help in capture of San Juan Hill.

The Signal Corps' first balloon, the General Myer, was destroyed in a windstorm at Fort Logan, Colo. Sgt. William Ivy and his wife made a new one of silk and this was the only Army balloon on hand when the Spanish-American War broke out in 1898.

After a series of misadventures, Lt. Col. Joseph E. Maxfield and the three officers and 24 enlisted men of the balloon corps arrived at Santiago, Cuba, in late June. The extreme heat softened the varnish causing the sides of the bag to stick together, tearing when the balloon was unpacked.

After hasty repairs, flights were made which confirmed the presence of the Spanish fleet in the Santiago harbor.

The balloon went up again during the Battle of San Juan Hill on July 1. Observer Lt. Col. George M. Derby decided the balloon was too far from the action so it was moved to within 650 yards of the Spanish infantry's trenches.

On the second ascent, the observers discovered a new trail. Ground commanders used the trail to relieve congestion on the main road and used it to send an attacking force to strike the Spanish forces' flank.

Observers also suggested artillery be directed against the trenches on San Juan Hill. Historians believe the two air-directed actions may have been the determining factors in the capture of San Juan Hill -- Teddy Roosevelt and his Rough Riders not withstanding.

Balloon era bursts

The balloon was riddled by gunfire throughout the battle and was not repairable afterwards. A second balloon outfit was being organized in Florida, but the war ended before they made it to Cuba.

A new balloon detachment was formed by the Army in 1902, at Fort Myer, Va. But the future was about to catch up with the balloon, at a place called Kitty Hawk.

Bike-makers aim high

'Country Boys' didn't invent airplane

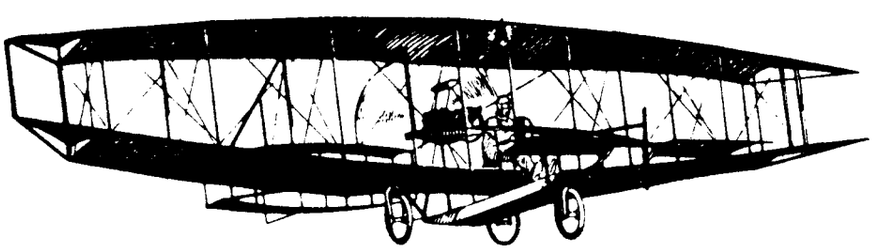
Contrary to popular notion, Wilbur and Orville Wright weren't just a couple of country boys who just happened to invent the airplane one day while puttering around in their bicycle shop.

They were an exceptional pair of intelligent men who just happened to operate a bicycle manufacturing and repair business, in Dayton, Ohio.

Sons of a United Brethren Church bishop, the two showed promise even in school. Wilbur was a gymnast and athlete, and took courses in Greek and trigonometry. Orville, four years younger, printed a neighborhood newspaper in his junior year of high school, with Wilbur as editor.

The brothers opened their bicycle business in 1892, and by the time the business was going good in 1896, their interest had settled on aviation.

The two researched everything they could find on aviation. After some experiments with kites, they even wrote to Octave Chanute, introducing themselves and asking for suggestions. Wilbur and Orville made their first visit to Kitty Hawk, N.C., in 1900—after contacting the U.S. Weather Bureau about wind conditions in various parts of the country. On the barren sand dunes, they assembled their first glider—a biplane with an elevator mounted on the front, rather than the tail. The glider incorporated a mechanism which warped the wings at their tips for steering control.



After a summer of gliding which included flights as far as 400 feet and landings at almost 30 mph, they returned to Dayton and built an improved glider. Back at Kitty Hawk the next summer, they made numerous successful glides (including some in the presence of Octave Chanute). Yet, they were still certain the glider had design problems; especially after Wilbur spun in on one flight, and wrecked the craft.

Back in Dayton, they decided that German aeronautical pioneer Otto Lilienthal's tables of air pressure for wing designs had to be wrong. So, they built a six-foot-long wind tunnel and tested 48 different wing forms, developing air-pressure tables for each.

Their redesigned 1902 glider added a moveable rudder at the rear, different controls and a flatter wing. The glider was an amazing success, with controlled flights of more than 600 feet.

Following a summer of soaring over the Carolina dunes, the Wrights returned to Dayton and began examining engines and propeller designs. In just six weeks, with the help of mechanic Charlie Taylor, the two developed a four-cylinder, 12 horsepower engine weighing about 140 pounds.

Designing a propeller was more time consuming. It took three months to develop measurements, calculations and designs. By the end of that time, they were sure of one thing: Everyone else's designs were wrong. Their own propellers were slim eight-and-a-half foot hand-carved pieces of laminated spruce.

Back at Kitty Hawk in 1903, they practiced gliding while waiting for Charlie Taylor to finish making some parts at Dayton.

Finally, on Nov. 4, they were ready. Their twin-propped glider, weighing about 600 pounds, was too heavy for regular launching (holding it up by the wingtips) or for running on wheels on the sand. They built a 60-foot track for a small, wheeled dolly, from which the aircraft would lift off.

Unfortunately, when they tested the engine, it sputtered and backfired and the props refused to spin smoothly. The props finally jerked loose which damaged the shafts. This caused another delay while the shafts were sent to Dayton.

They tried again on Dec. 14. Wilbur revved the engine and released the restraining wire and the craft leaped forward. However, Wilbur had no previous experience controlling a powered aircraft. The craft left the trolley nose-high and stalled, plowing up sand about 100 feet from the end of the track. Wilbur wasn't hurt and the aircraft had minimal damage.

Making history

Thursday morning, Dec. 17, was a wet, windy day. The brothers moved their aircraft into position on the track. Orville slipped into the pilot's position, lying prone across the bottom wing. He revved the engine and released the wire.

Twelve seconds and 120 feet later, the craft came down in the sand on its landing skids. Powered, controlled flight had been born.

The Wrights made three more flights that day, the longest was 852 feet and lasted 59 seconds, before damaging their craft on landing. While moving the craft back to their campsite for repairs, the wind caught it and flipped it on its back, damaging it further.

The Wrights would go on to repair their aircraft, and make more flights. And, from these beginnings would come aircraft which would touch the very edge of space.

But, for now, it was enough just to have been first. Not bad for a couple of country-boy bicycle makers from Ohio.

Tragedy strikes early pilots

Efforts to persuade Army to buy airplane end in first aircraft fatality.

The Army almost blew it. Wilbur and Orville Wright offered the War Department exclusive rights to their airplane, designs and knowledge in January 1905.

The answer was a polite refusal.

In October of that year, however, the French government asked about the Wrights' services. Upset with the War Department, the brothers crated one of their planes and quoted the French a $250,000 price tag.

Deal sours

The Wrights took their crated plane to France in 1907, but things soon went sour. They refused to uncrate the plane until the French agreed to buy it, and the French wouldn't buy until they saw the plane in the air. The Wrights went home, developed a new airplane and tried the Army again.

This time, in January 1908, the Army Signal Corps signed a contract with the Wrights to build an airplane for $25,000.

The Wright Military Flyer was delivered in September 1908 for a demonstration at Fort Myer, Va. Orville Wright made several demonstration flights, carrying Lt. Frank P. Lahm to show the plane's ability to carry a passenger.

Idea okay'd

After eight days of demonstration flights, tragedy struck. With Lt. Thomas E. Selfridge as passenger, Orville was flying at an altitude of about 125 feet when the plane went out of control. A propeller blade broke off when it snapped a rudder control wire, throwing the plane out of balance. Selfridge was killed in the crash, and Orville suffered a broken leg and broken ribs. The lieutenant was the first airplane accident fatality.

In June 1909, Wilbur and Orville brought a Wright "A" Flyer to Fort Myer, and after several successful demonstrations, the Army accepted the airplane Aug. 2, 1909.

At nearby College Park, Md., a training field was set up and Wilbur taught Lt. Frederick E. Humphreys and Lt. Frank P. Lahm to fly. On Oct. 26, 1909, Humphreys became the first Army pilot, soloing just minutes before Lahm.

Lt. Benjamin D. Foulois returned from temporary duty in France in time to receive flight instruction from Wilbur and Humphreys.

Flying halted

On Nov. 5, 1909, the Army temporarily lost its air strength when Lahm and Humphreys crashed the plane. Both escaped uninjured, but Lahm was ordered to return to the cavalry and Humphreys to the engineers. Both had been away from their respective branches of the Army for the maximum allowable four years.

The Army was suddenly without a useable plane or a qualified pilot.

Foulois, the only remaining Army officer on flying duty, was directed to take the repaired airplane to Fort Sam Houston in February 1910. With a party of enlisted men, he packed up the plane and reported to the fort near San Antonio, Texas.

Pilot by mail

Since there were no qualified military instructors available, when Foulois started flying again, all of his flights were solo. He received instruction from the Wright Brothers by mail, becoming the first correspondence-school pilot.

After a few landing accidents, the Wrights sent an instructor from their school in Dayton, Ohio, to help Foulois master landing techniques. But, by early 1911, the aircraft was so battered the Wrights recommended against flying it.

Robert F. Collier, a publisher, bought a Wright "B" Flyer in 1911 and loaned it to the Signal Corps. Shortly thereafter, the Army delivered a Wright "B" Flyer and a Curtiss single-seater to Foulois.

Three Army officers stationed in California, Lieutenants Paul W. Beck, George E. M. Kelly and John C. Walker arrived at Fort Sam Houston right after the two new airplanes were delivered. On May 10, 1911, Kelly was killed in a crash. Fort Sam Houston's commanding general halted any further flying.

Meanwhile, the Signal Corps was building a flying school back at College Park. The planes and men were moved there, where they were joined by Lieutenants Henry H. "Hap" Arnold, Thomas DeWitt Milling and Roy C. Kirtland.

Captain Foulois was ordered to duty at the Militia Bureau in Washington, D.C., and didn't fly again until 1913.

The College Park school trained dozens of lieutenants in both day and night flying techniques, firing a machine gun from the air, and bombsight testing.

Shots exchanged

On Nov. 30, 1913, in the skies over Naco, Mexico, two Americans, Phil Rader and Dean Ivan Lamb, flying for opposing factions during a revolution, exchanged pistol shots. Neither pilot was wounded, neither aircraft damaged—but a precedent had been set.

The skies over Mexico would have their own fascination and dangers for other Americans within a couple of years. The Army's fliers were about to go to war.

Punitive expedition gets worst end of deal

It was called the Punitive Expedition. But members of the 1st Aero Squadron probably wondered who was being punished—them or the enemy?

Mexican revolutionaries under Gen. Francisco "Pancho" Villa struck north into Columbus, N.M., March 9, 1916. They killed 17 Americans.

Villa attacked the United States for letting Gen. Venustiano Carranza use American railroads to transport his revolutionary troops against Villa.

The United States prepared to retaliate. Eight Curtiss JN-3 airplanes of the Army's 1st Aero Squadron at Fort Sam Houston, Texas, were crated and loaded into trucks.

On March 13, Capt. Benjamin D. Foulois led the 12-truck convoy to Columbus, bringing with him 11 officers, 85 enlisted men and one civilian employee. They arrived March 15.

Several days later the squadron was ordered to fly to Nuevas Casas Grandes, Mexico. All eight aircraft took off.

Pathetic planes

One returned due to motor trouble. Four landed at Las Ascencion, Mexico, because of darkness. One landed at Ojo Caliente, Mexico, and another at Janos, Mexico. The eighth landed near Pearson, Mexico, and was so badly damaged on landing the pilot abandoned it and walked the nearly 50 miles to Nueva Casas Grandes.

The next day, the airplanes from Las Ascencion flew into Nueva Casas Grandes. They were later joined by the aircraft from Columbus and Janos. The airplane which landed at Ojo Caliente was also damaged, and the pilot spent several days fixing it.

One aircraft, returning from a reconnaissance mission on March 20, was caught in a whirlwind and destroyed while landing. The pilot, Lt. Thomas S. Bowen, broke his nose in the accident.

That established the pattern for the squadron as they chased Villa's troops all over the Mexican state of Chihuahua.

The Curtiss airplanes they were using were pathetically underpowered and unable to climb through the wind-buffeted low mountain passes. They were unarmed-except for the service pistol carried by the pilots—and, essentially, two-seater trainer airplanes.

Before the end of March, Foulois was begging the expedition's chief of staff for 10 high-powered, high-climbing, weight-carrying airplanes.

...the mob was making insulting remarks, burning holes in the aircraft wings with cigarettes...

He didn't get them, of course.

On April 7, Foulois was jailed in Chihuaha City.

He and Lt. Herbert A. Dargue had flown into the town carrying dispatches for the American consul. Another aircraft, flown by Lt. Joseph E. Carberry and Capt. Townsend F. Dodd, landed at the opposite end of town.

Foulois told Dargue to join the other plane while he took the dispatches into town. As Dargue took off, four police officers opened fire on the airplane from about a half-mile away. Foulois ran to them and managed to stop their firing, but was arrested and taken to jail.

After considerable wrangling with the authorities, he was released and went to find the airplanes. He found his plane and Dargue surrounded by a mob.

Foulois was told Dargue had found the other airplane, and Dodd had delivered the duplicate dispatches to the consul. In the meantime, the mob was making insulting remarks, burning holes in the aircraft wings with cigarettes, slicing holes in the fabric and removing nuts and bolts.

Throwing stones

Dodd managed to get his plane off safely, but when Dargue took off amidst a shower of stones, the top section of the fuselage came loose and struck the stabilizer. He managed to land safety, and held the crowd at bay until Foulois arrived.

It took the rest of the day to repair the damage.

Reconnaissance and mail-carrying missions continued, and the number of airplanes continued to dwindle.

Dargue and his observer, Capt. R. H. Willis, crashed in a forced-landing near Chihuahua City on April 19. The lieutenant was unhurt, but Willis sustained a bad scalp wound and his legs and ankles were bruised. After torching their airplane, they walked the 65 miles to San Antonio in Chihuahua.

The squadron moved back to Columbus where the two remaining aircraft were declared unsafe for further service and destroyed.

In his end-of-campaign report, Foulois honored his pilots by noting foreign governments had decorated their pilots for less perilous flying. Then he wrote, "The experience gained by the commissioned and enlisted personnel of this command, . . should result in more rapid and efficient development of the aviation service in the United States Army."

It would be too little, too late. In Europe, fliers were already dying over the battlefields of France. World War I had begun, and there would be little time to get the Air Service in shape before they, too, were in the thick of things.

America had lagged behind badly in military aviation. They would soon pay a bloody price for unpreparedness.

World War I

Aerial combat glamorized, but grim business

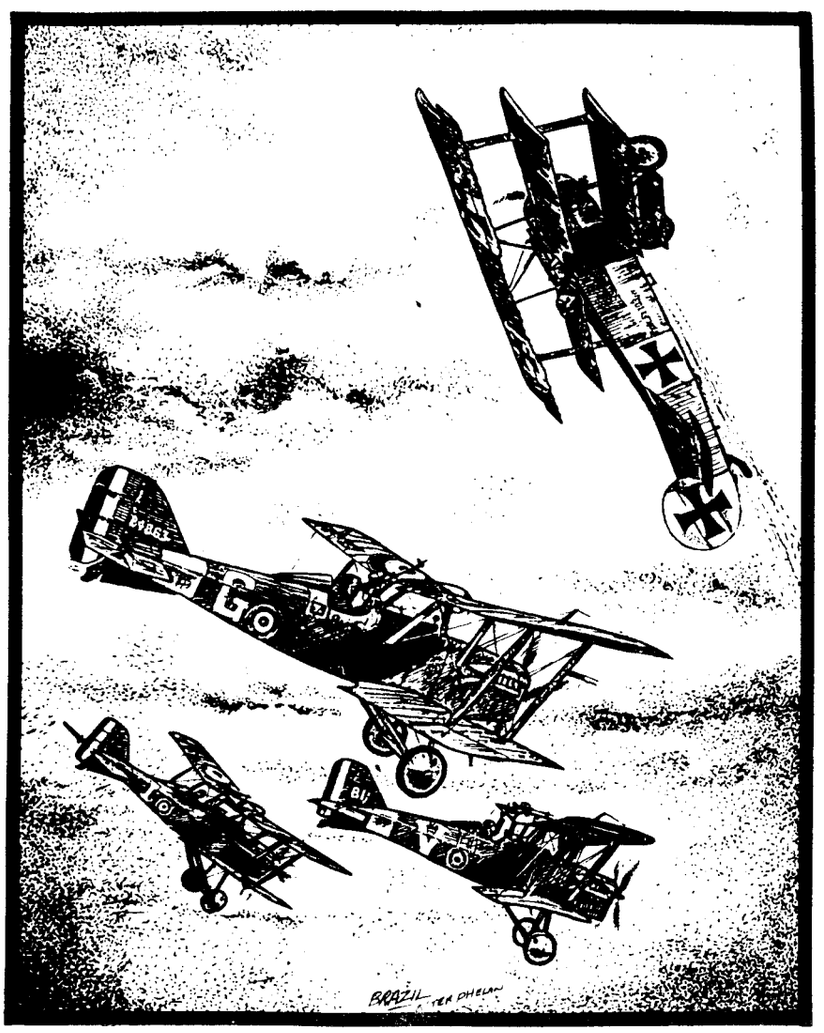
The first few months of World War I, in 1914, established the characteristics of military flying operations for generations to come.

On the one hand, bomber crews stolidly plodded in and bombed targets in the enemy's rear areas, establishing their strategic role.

On the other, unarmed observation crews flew around the front-line areas, took photographs of enemy positions and waved at one another as they passed in the air.

But flying operations soon became deadly serious. In January 1915, an Allied pilot reportedly shot down a German observation plane with a rifle. This was the first recorded air-to-air combat of the war.

A month later, French pilot Roland Garros mounted a machine gun on his aircraft designed to fire through the propeller blades. Tapered metal blocks were fastened to the blades to deflect bullets which missed the space between the propellers.



On his first flight out, Garros surprised the crew of a German observation aircraft by shooting it down. The synchronized machine gun worked perfectly.

Garros repeated his feat two more times before he was forced down behind German lines and captured. The Germans studied Garros' aircraft and within a few weeks, they were flying planes with synchronized machine guns.

The British soon developed their own synchronized gun, and a new breed of pilot was born. The Germans called them jagdflieger, the French called them chasseurs and the British called them pursuit pilots.

In 1916, the United States was still officially neutral, but many Americans couldn't wait to get into action. Some joined the British forces, either in Great Britain or through Canada. Nineteen of them went on to become aces in the Royal Flying Corps.

But the French seemed to attract the more adventurous Americans. They signed on with the French Foreign Legion and were later assigned to flying duties.

One of these was Eugene J. Bullard, a black American prize fighter. He enlisted in a legion unit called "The Swallows of Death." Bullard became known as "The Black Swallow." After recovering from wounds received at the front, he applied for flying duty and was accepted.

Bullard later won $1,000 from a fellow American who had bet blacks were incapable of learning to fly.

His plane bore the insignia of a heart pierced by an arrow, with the motto, "All Blood Runs Red." He was credited with downing two German planes.

In February 1916, the French organized a unit called the Escadrille Americaine. It was later named Escadrille Lafayette after the French marquis who helped America win its revolution.

Soon, Spads and Nieuports, bearing the unit's stylized American Indian chief insignia, were snarling through the skies in search of German prey. One of the most famous was Raoul Lufbery, who shot down 17 German planes.

Movies produced after World War I glamorized the aerial combat of that war. In reality, it was a grim business. Pilots flew fragile wood and canvas planes, exposed to the elements, with unreliable engines, no armor and no parachutes.

...the pilot must have slumped in his seat, jamming the controls in his agony...

Here's a description of a kill by Capt. Rene Fonck, the leading Allied ace:

"I swooped down but waited until I was a few meters away before opening fire...aiming directly for the middle of the plane, my bullets raked the area which housed the motor and the aircraft's crew. It wasn't long before I saw the results.

"Undoubtedly killed by the first burst, the pilot must have slumped in his seat, jamming the controls in his agony, for the plane immediately began to spin.

"While rapidly banking to avoid collision, I saw the body of the observer, still alive, falling from the upside-down plane. For a split second he had tried to remain in his seat. He passed only a few meters from my left wing, his arms frantically clutching at the emptiness. I shall never forget that sight..."

Back in the United States, the Army Signal Corps' Aviation Section was still fighting for funds, people and airplanes. The Army owned two flying fields and 55 trainer aircraft. Gen. John J. Pershing later noted, "...51 were obsolete and the other four were obsolescent."

War clouds were on the horizon, though, and the Army would soon pay a precious price in blood for its unpreparedness.

Americans pay a bloody price for their unpreparedness, and still they don't learn...

War yields America's ace of aces

April 14, 1918, was a misty, dreary Sunday at the 94th Aero Squadron airdrome near Toul, France. Capt. David Peterson and Lts. Reed Chambers and Eddie Rickenbacker flew the squadron's first war patrol at dawn, but returned without seeing a German plane.

Later that day, Lts. Alan Winslow, Douglas Campbell and James Meissner were on alert duty when balloon observers reported two German airplanes near the airdrome. The trio dashed to their Nieuport aircraft and strapped in. Winslow and Campbell started their engines and took off but Meissner sat and cursed a prop that wouldn't turn over.

Just after taking off, Winslow and Campbell were startled by two German scout planes which popped up over the trees at the edge of the airdrome. The two Americans opened fire.

Winslow's opponent, a Pfalz D-3, sideslipped and sent a burst of bullets through the Nieuport's wing. Winslow pulled a hard turn at treetop level and let off a long burst

He'd never shot down an enemy aircraft while flying for America, but his aggressive spirit lived on in other pilots.

from his Vickers machine gun. The riddled Pfalz crashed into the grass of the airdrome.

Seconds later, an Albatros D-5—Campbell's opponent—streaked down in flames a few hundred yards away. The dogfight took place within sight of hundreds of officers and enlisted men on the airdrome, considerably boosting morale.

Morale needed a boost. America had officially been at war for a year, but was just now entering combat. None of their planes were American-made. In fact, many of their pilots learned to fly at British, French and Italian pilot training schools. Many of their senior pilots had crossed over from other nations' air services, taking a corresponding jump in rank in many cases.

At odds

To make matters worse, the American Expeditionary Force's two top air leaders, Brig. Gen. Benjamin Foulois and Col. William "Billy" Mitchell, were at loggerheads over almost every decision. Finally, Foulois resolved the situation himself, accepting a position overseeing Air Service activities. This left the way open for Mitchell to become the operational commander of the combat flying units.

Maj. Raoul Lufbery, a 17-kill ace with the Lafayette Escadrille in France, crossed over to the American Air Service with the arrival of the expeditionary force. He took the pilots of the 1st Pursuit Group under his wing and coached them through their early war patrols.

Then, on May 19, he leaped or fell from his blazing Nieuport after a fight with an Albatros six miles from the airdrome. His body was found in a little flower garden in the village of Maron. He'd never shot down an enemy aircraft while flying for America, but his aggressive spirit lived on in other pilots.

By the end of May, Campbell and Rickenbacker were aces. Campbell was wounded a week later and sent home to America. Rickenbacker, a former race car driver and chauffeur, went on to become America's ace of aces, with 22 airplanes and four balloons shot down.

No parachute

By the end of the war in November 1918, pursuit pilots of the AEF had destroyed 777 enemy aircraft and balloons. At least 71 Americans qualified as aces—shooting down five or more enemy airplanes or balloons. Between them, the 71 accounted for 450 planes and 50 balloons.

Bombing squadrons carried out 150 bombing attacks, during which they dropped 138 tons of bombs and penetrated as deeply as 160 miles behind the German lines.

American losses in combat included 289 planes and 48 observation balloons. Many of the 237 officers and enlisted men killed in battle would have lived if the Air Service had required use of parachutes—such as the Germans began using toward the end of the war. But, the fliers stubbornly rejected them as a sign of cowardice and a lack of confidence in one's ability and equipment.

Still unprepared

Since America entered the combat theater only eight months before the Armistice, the Air Service had little affect on flying operations. In fact, even at the height of its strength in November 1918, the Air Service accounted for only one-tenth of the allied air strength.

The first air war gave much impetus to the training of pilots and the improvement of aircraft. Movies and dime novels after the war helped to glamorize the exploits of the aviators, and helped create a generation of air-minded youth. In these ways, the war contributed much to the advancement of aviation.

Meanwhile, America's Air Service came back from the war covered with glory, but found budget-cutters and pacifists hard at work. The fabled fliers returned to find America hadn't learned the bitter lessons of being unprepared.

American and French troops drink a toast to the armistice, but there were tough times ahead for jobless pilots.

Air Service flies from peaks to pits

The Air Service went from the peaks to the pits shortly after World War I.

The nearly 200,000 members of the wartime Air Service soon dropped to 10,000. Most of those who remained were considerably reduced in rank. It wasn't unusual to see a colonel bumped down to captain.

In the year that followed the war, Congress appropriated less than a third of the budget money requested. Army officials made it clear there was not a single dollar available to purchase new aircraft.

The small Air Service was also being torn apart by controversies on how its limited forces might best be applied, trained, equipped and controlled. Eventually, after years of heated argument, the air leaders hammered out agreements which became basic doctrines of the air arm.

Much of the heat was generated by Brig. Gen. Billy Mitchell, the colorful, outspoken assistant chief of the Air Service. Mitchell embarked on a crusade to prove the Air Service should have a major role in the nation's defense.

It wasn't unusual to see a colonel bumped down to a captain

Unfortunately, the air arm was quite weak at the time. It had only 1,500 Curtiss Jennies for training, 1,100 DeHavilland DH-4Bs for observation and general-purpose duties, 179 British built SE-5A pursuit planes and 12 Martin MB-2 bombers. From mid-1920 to mid-1921, 330 of these aging aircraft crashed killing 69 men.

In July 1921, the Navy decided to call the Air Service's bluff on claims that bombers were superior to battleships. They put captured German warships off Chesapeake Bay and invited the Air Service to use their bombers from Langley Field, Va., on them.

Martin bombers sent the powerful battleship Ostfriesland and two others to the bottom of the bay. In another test in 1923, the bombers sank the obsolete American battleships Virginia and New Jersey off Cape Hatteras. The Navy ignored the results, noting the ships weren't moving or shooting back.

The fiery Mitchell, after five years in this position, was banished by the Army's high command to San Antonio, Texas, in 1925 and reduced to his permanent grade of colonel. That didn't silence him.

When the Navy dirigible Shenandoah was lost in a storm with all hands in September 1925, he publicly blasted the high commands of the Army and Navy as guilty of "incompetency, criminal negligence and almost treasonable administration of the National Defense."

President Calvin Coolidge and Secretary of War John Weeks ordered a court-martial. The tempestuous two-month court-martial in the nation's capital served as a public forum for airpower advocates, but the outcome was inevitable. Found guilty, Mitchell was suspended from duty for five years. He resigned in 1926 to continue his fight on the outside.

For the dedicated band of Air Corps people who labored through years of obsolete equipment, it was a breath of fresh air.

While controversies among the military leadership drew the headlines, the Air Service was making some star-spangled flights that expanded the frontiers of aeronautics.

Air Service Lts. Cy Bettis and Jimmy Doolittle won the Pulitzer and Schneider Cup Air Races within a two-week period in 1925. Lts. Oakley G. Kelly and John A. Macready made the first nonstop flight across the country, in May 1923. They flew the 2,520 miles between New York and San Diego in less than 27 hours.

In August 1923, Lts. Lowell Smith and John Richter set a new endurance record, staying aloft 37 hours, 15 minutes over San Diego in a DH-4, with refueling provided by another DH-4.

In April 1924, four specially-built Douglas World Cruiser planes took off from Seattle. Two of the four returned to Seattle at the end of September. In the meantime, they had flown 26,000 miles—around the world.

In 1926, Congress changed the name of the Army's air arm to Air Corps. This move established a new assistant secretary of war for air position, added two brigadier generals to Air Corps headquarters and authorized a five-year expansion program.

By 1930, the Air Corps had expanded from 919 officers and 8,725 enlisted to 1,305 officers and 13,400 enlisted. Planes on hand now numbered 1,709—most of them new pursuit, attack, bombardment and observation planes.

For the dedicated band of Air Corps people who labored through years of obsolete, worn-out World War I equipment, it was like a breath of fresh air.

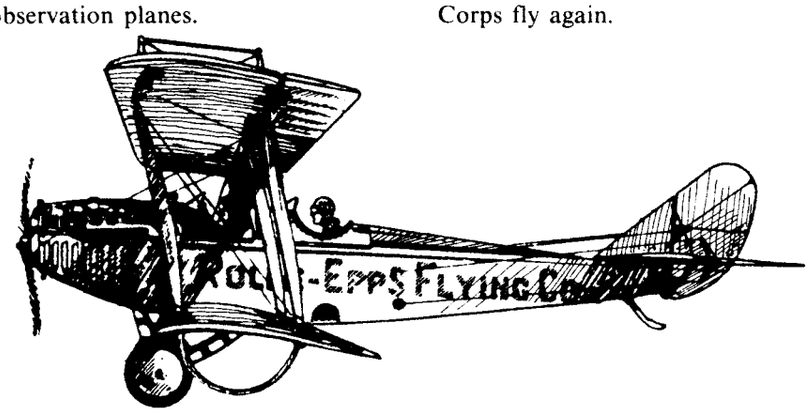
In 1929, as the tumultuous decade was drawing to a close, the Air Corps made headlines again. A Fokker transport, known as the Question Mark, stayed aloft for nearly 151 hours over Los Angeles.

The crew used a refueling technique perfected in 1923 to accomplish that feat. The Fokker was piloted by Maj. Carl Spaatz— who became the first chief of staff of the U.S. Air Force in 1947.

The "Roaring '20s" well described the decade for the Army's air arm. Flying high during the Kaiser's war, the fledgling Air Service was clawed by military traditionalists and left to dry up on the peacetime desert.

But a few gutsy aero-futurists, through their deeds, helped the Air Corps fly again.

End of war spawns daring gypsy pilots



The armistice that ended World War I threw thousands of military aviators out of work.

The peacetime Air Service only had positions for about 900 pilots, and those were quickly filled by officers with regular commissions. Most reserve pilots were sent back to civilian ife.

However, there was some salvation at hand. While most of the actual combat aircraft had been destroyed at the end of the war, thousands of Curtiss JN-4 "Jenny" trainers were left sitting on airstrips throughout the United States. The government was selling them "dirt" cheap.

Thus, gypsy pilots were born. Their beds were frequently a blanket under the aircraft's wing. Their maintenance department consisted of baling wire, a pot of glue, a can of lacquer, a hammer, a pair of pliers and a screwdriver.

They flew wherever there was a strip of land long enough and level enough to land on. They made their money selling five-minute plane rides for $15. As more joined their ranks, the price dropped to $5.

The market for plane rides was soon lost, however, as crash after crash of these worn-out "crates" headlined the newspapers.

Some gypsies quit when the market dried up. Others started flying stunt shows, figuring they could charge for showing off. Wing-walking and parachute jumps were part of the "barnstormers" inventory.

Gypsy pilots would do most anything for money and Hollywood discovered this in a hurry. The silver screen was soon ablaze with aerial dogfights, chase scenes, plane-to-plane transfers and other thrills. Many scenes were as dangerous as they looked, and dozens of pilots and stuntmen died making these classic films.

Some serious flying eventually took place during this era. The U.S. Post Office began hiring pilots to carry the mail in its war-surplus DeHavilland DH-4s. By 1924, the Post Office had established secondary landing fields every 25 miles from coast to coast.

Many of these flights proved dangerous. Pilots had to fly aging aircraft through mountain passes because the planes lacked the power to fly over them.

One airmail pilot earned his nickname after a series of emergency landings, crashes and nighttime parachute bail-outs. Before this, Charles Lindbergh was known as "Slim." But after his string of misadventures, he was called "Lucky Lindy."

Back in 1919, two British officers, Capt. John Alcock and Lt. Arthur W. Brown, flew the first non-stop transatlantic flight in a twin-engine Vickers-Vimy bomber.

However, until 1927 no one had flown it alone, nor had anyone flown

Pilots Flew aging aircraft through mountain passes because their planes lacked the power to fly over them.

from the United States directly to the mainland of Europe. Then on May 20, "Lucky Lindy" took off from Roosevelt Field, N.Y., in a drizzling rain, flying a specially-built Ryan monoplane, the "Spirit of St. Louis."

Battling sleep, wind, fog and rain, Lindbergh landed in Paris, 33 1/2 hours later, having flown the 3,600 miles with incredible navigational accuracy.

In 1926, Adm. Richard Byrd and Floyd Bennett made the first flight over the North Pole. In June 1927, Air Corps Lts. Lester Maitland and Albert F. Hegenberger flew a Fokker Trimotor transport from Oakland, Calif., to Wheeler Field, Hawaii. In 1929, Byrd and Bernt Balchen made the first flight over the South Pole.

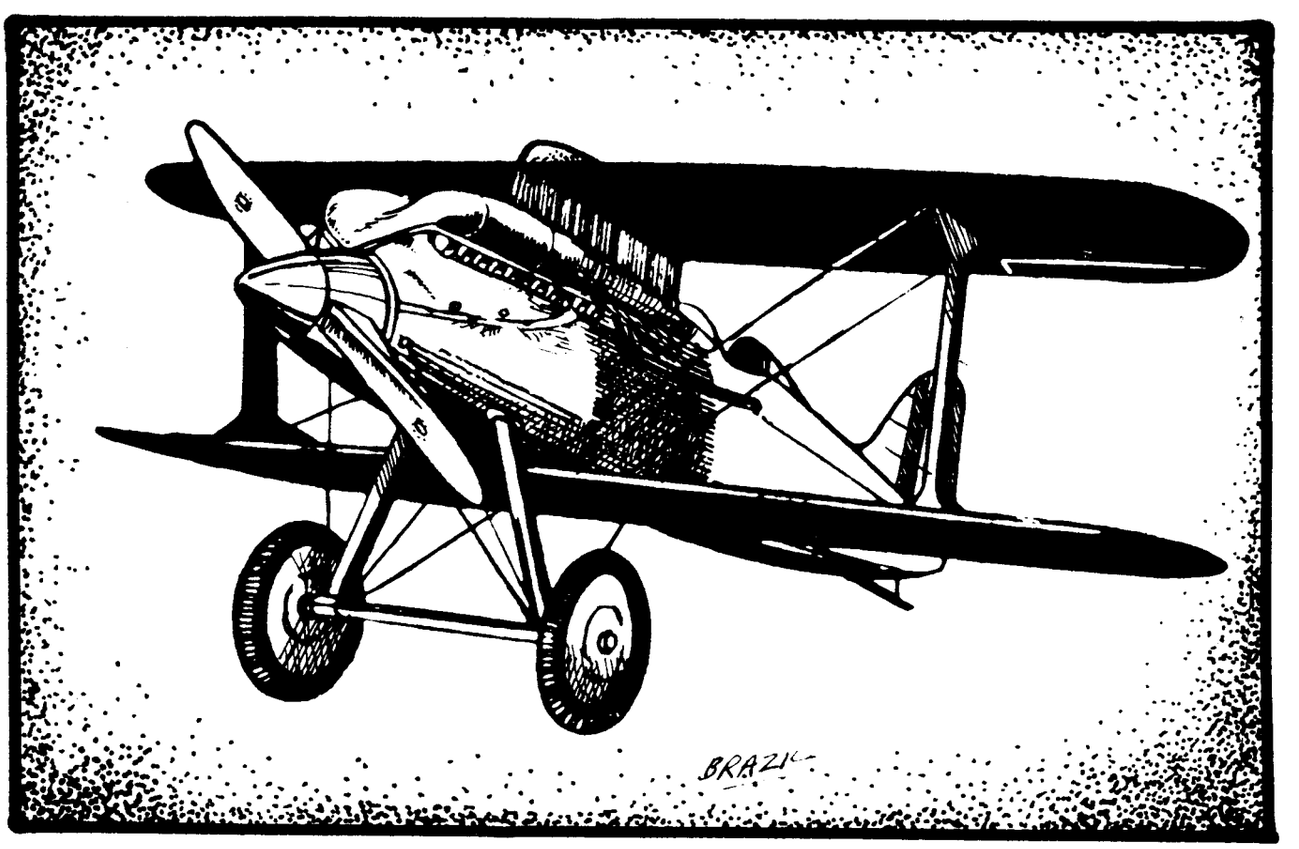
Also in 1929, regularly-scheduled airline flights were started in the United States. These flights were designed to serve the average American consumer.

It wasn't much, at first. Passengers boarded a Pennsylvania Railroad train in New York City at night, then went by rail to Columbus, Ohio. There, they boarded a Transcontinental Air Transport flight to Waynoka, Okla.

At Waynoka, they hopped aboard a Santa Fe Railroad train to Clovis, N.M., where they finally boarded another TAT Trimotor for a flight to Los Angeles. The entire trip took "only" 48 hours.

Within seven years, America would have a coast-to-coast network of airports, and the first links with Europe would be forged.

On the civil aviation side, the 1920s had been a time of pioneering feats, fly-by-night gypsies, stunts, speed races and silver screen antics. The decade wasn't wasted, however, Americans had discovered the skies.



The Curtiss R-6 racer is still considered by many romantics, "the most beautiful aircraft ever built." This aircraft won the 1922 Pulitzer Trophy.

Army kicks aviators in teeth

The fledgling Army Air Corps was mugged during the Depression.

When the stock market crashed in 1929, the Air Corps was in the middle of a five-year expansion program. Despite deep budget cuts by the Secretary of War and the Army General Staff, the expansion was going along fairly well.

The money crunch gave the Army General Staff the chance to kick its upstart aviators in the teeth. They cut the Air Corps budget by 40 percent. Not even the horse cavalry budget was cut that badly.

There was a bright side, however. The Air Corps had expanded by nine squadrons, and most were equipped with new aircraft.

It was a tough time to be in the Air Corps. Faced with hostility from the nation's senior military leaders and acute shortages of everything, the aviators could only hope for better times.

Things did start looking up for the Air Corps in 1931. Army Chief of Staff Gen. Douglas MacArthur made an important agreement with the Navy that year. That deal made the Air Corps responsible for the land-based defense of the U.S. coasts and its overseas possessions.

The winter of 1932-33 brought unprecedented blizzards to the Southwest. Lt. Col. Henry H. "Hap" Arnold and his bombardment group from March Field, Calif., made successful airdrops of food to thousands of isolated people throughout the region.

In February 1934, Postmaster General James A. Farley cancelled what he considered to be illegal airmail contracts with the airlines. President Roosevelt stepped in and ordered the Air Corps to carry the mail.

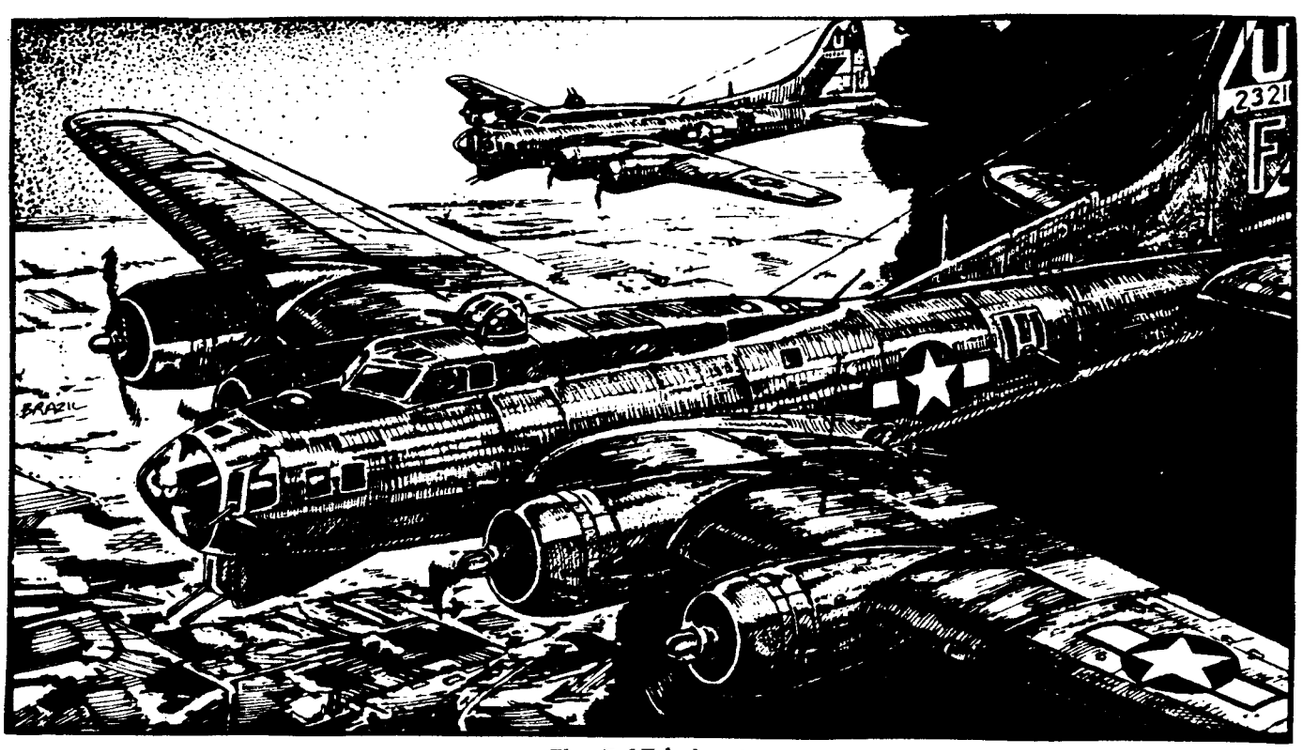
The Air Corps lacked the proper planes, equipment, ground stations and experience in all-weather instrument flying to deliver mail. By May, when the Air Corps handed the job back to the commercial airlines, nine pilots had died carrying the mail.

Dozens of other accidents also occurred as pilots in open-cockpit planes flew through rain and snow groping their way to landings at fogged-in airports.

It was a deplorable situation. Even, the news media seemed to be rooting for the Air Corps to fail. And Congress, who made political hay about "legalized murder" failed to appropriate the $800,000 it promised the Air Corps in per diem allowances.

The Air Corps carried out its mission, but the accidents stirred considerable public outcry. The War Department and Congress took action to correct the inadequacies of American airpower by creating General Headquarters Air Force.

The Air Corps had many squadrons which supported the ground armies. But GHQ Air Force provided a separate combat command, with bomber and pursuit squadrons, directly under the Army General Staff.



The B-17 is born.

Then in 1939, GHQ Air Force was placed directly under the chief of the Air Corps. This step came on the eve of an expansion which would lead to the creation of the U.S. Army Air Forces.

While the creation of GHQ Air Force was a major step toward the goal of an independent air arm, the real action was concentrated on obtaining a strategic bomber.

The Air Corps entered the 1930s flying big, open-cockpit B-9 bombers and smaller, closed-cockpit Martin B-10s. Arnold made a big splash in the newspapers in 1934 by leading 10 B-10 bombers on a round trip from Washington, D.C., to Alaska to show the Air Corps' ability to defend the coastlines.

A year later, the Boeing 299 prototype took to the air for flight tests. The Air Corps gave the four-engined bomber the designation XB-17. In its flight tests, the plane flew 2,100 miles nonstop from Seattle to Dayton, Ohio, averaging 232 mph. Its success in competition seemed assured.

However, when the fly-off between the Boeing bomber and the two-engine submissions from other makers took place, the XB-17 crashed on takeoff.

An investigation proved pilot error—failure to unlock the control surfaces—but rumors said the four-engine bomber was too much airplane for the pilot to handle.

Four - engine bomber too much airplane for pilot to handle

The contract went to Douglas for their B-18, a bomber version of the DC-3. However, the Air Corps was allowed to order 14 B-17s for operational testing.

In 1938, three B-17s of GHQ Air Force intercepted the Italian liner Rex 725 miles from New York in a demonstration of the Air Corps' effectiveness at the coastal defense mission.

This immediately led to a verbal agreement between the Army and Navy leadership which limited the Air Corps to flights of no more than 100 miles from shore. The Navy was concerned the Air Corps would prove the vulnerability of its ships. The Army was also concerned the Air Corps would ignore its primary task of supporting the ground units.

Despite the concern, the Air Corps was allowed to increase its request for B-17s to 40.

While the U S. defense establishment was playing parochial games, Germany, Italy and Japan were conquering other nations with their built-up forces. Finally, President Roosevelt got into the act.

The President gave his support to the Air Corps and the American aircraft manufacturers, and Congress passed a bill in 1939 authorizing the Air Corps 5,500 aircraft thus, doubling its strength.

It was a terrific boost to Air Corps morale. But it was too little, too late. The battles in Europe and Asia and Africa would soon send their long shadows over the United States.

From bi-plane to jet

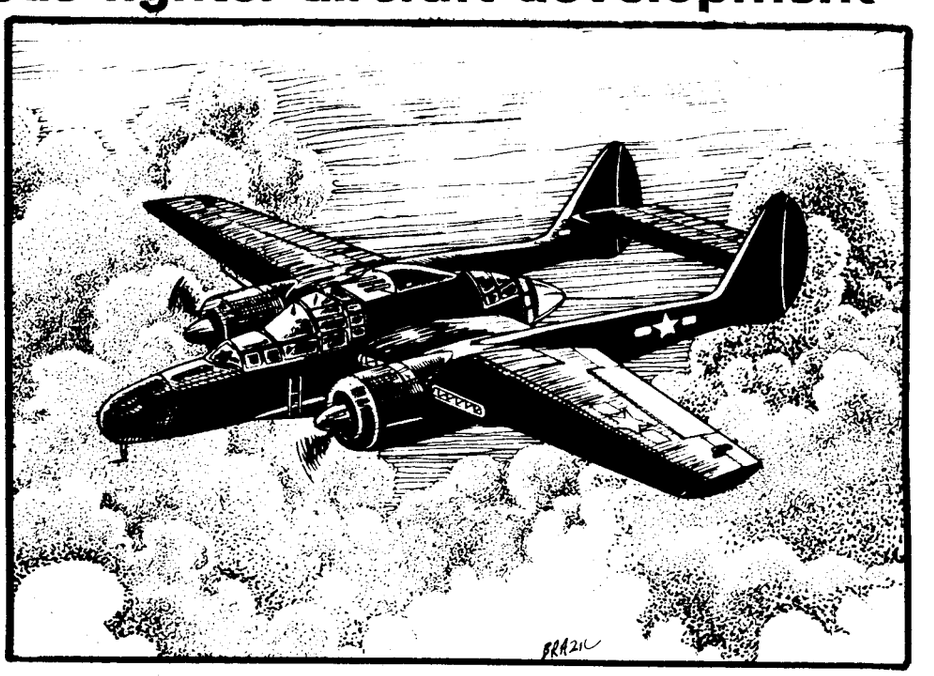
Wartime speeds fighter aircraft development

The common conception of the World War II fighter aircraft is a sleek, low-winged silver plane with a bubble canopy, big propeller and tons of guns in the wings.

However, consider the Gloster Gladiator. Britain's Royal Air Force had several squadrons of biplane Gladiators when World War II broke out. Three of these aircraft, nick-named Faith, Hope and Charity, fought a desperate, successful battle to help prevent the island of Malta from falling to the Germans.

Consider, too, the Messerschmidt Me-163 Komet. This stubby little fighter carried two 30mm cannons and 24 unguided rocket projectiles to 39,000 feet in minutes. Once there, however, it had only two minutes combat time due to a limited, hydrogen fuel supply. It was a rocket.

Northrop's P-61 Black Widow



P-61

had two-engines, a crew of three and toted four 20mm cannons in the fuselage and four .50 caliber machine guns in a turret forward of its twin-boom tail.

The Dornier Do-335 Pfeil had an engine and propeller in the nose and an engine and propeller in the tail. This push-pull aircraft could do 413 mph at a high altitude.

While there were many aircraft that fit the classic fighter mold, fighter development during World War II went through many gyrations as missions and concepts changed.

When the United States entered the war, the three frontline fighters in the inventory were the P-38 Lightning, a twin-engined, twin-boomed fighter with a variety of cannon and machine guns in the nose; the P-39 Airacobra, with the engine mounted behind the pilot, a 20mm cannon firing through the propeller hub, twin .50 caliber machine guns in the nose and four .30 caliber machine guns in the wings; and the P-40 Hawk, a classic fighter with four .50 caliber machine guns in the wings.

...an air combat platform without equal, the P-51 Mustang

F-6F Hellcat

The P-40 went on to fame with the Flying Tigers in China and the RAF in North Africa, while its actual use by the Army Air Forces was limited. The P-39 turned out to be an absolute "dog" for dogfighting, but re-gunned versions with a 37mm cannon in the propeller hub and a bomb-carrying capability were successfully used by the Russians against German armored columns.

The P-38, on the other hand, won fame over the Pacific as the steed of many aces, including Majs. Richard Bong and Thomas McGuire, the two top American aces of the war. Its twin-engine capability brought many crippled aircraft back home over long stretches of water.

In 1942, the Army Air Forces received two new fighters. One was an American version of an aircraft built in the States for the RAF. It was underpowered and a little disappointing, especially at high altitudes.

But when its 1,100 horsepower Allison engine was replaced by a 1,490 horsepower Rolls Royce Merlin, the P-51 Mustang became an air combat platform almost without equal.

As it went through further evolutions, the P-51 lost its faired-in cockpit and gained the bubble canopy for which it's best known. With 150-gallon drop tanks added, the P-51 was able to escort bombers from England to Berlin and back.

The other 1942 delivery was the heaviest, largest single-seat piston-engined fighter ever built. The P-47 was powered by an immense 18-cylinder radial engine delivering 2,300 horsepower, and carried eight .50 caliber machine guns in the wings.

The P-47 Thunderbolt was the official name, but pilots called it the "Jug" because it resembled a flying milk bottle. Incredibly rugged—pilots alleged it was built by the "Republic Concrete and Iron Works"—more P-47s were built than any other fighter.

One turbo-supercharged version of the "Jug" hit 504 mph—the fastest speed ever recorded for a piston-engined fighter in level flight.

...the zero was vulnerable to even minor hits, turning it into a flaming coffin

The Mustang and the Thunderbolt were the heart of the allied air effort and were flown by aviators from many nations.

On the sea-based aircraft side, the U.S. Navy came up with two winners in the F-4U Corsair and the F-6F Hellcat.

The Corsair—famous for its inverted gull wings and long nose—was the first American aircraft to exceed 400 mph in level flight. The Corsair was originally thought to be unsuitable for carrier operations, but proved to be the best carrier aircraft of the war.

The Hellcat was developed from the F-4F Wildcat by making slight structural changes and re-engining.

Ironically, while the Corsairs collected all the glory, the F-6Fs and predecessor F-4Fs bore the brunt of the air combat mission for the Navy. The F-6Fs even recorded more total kills than the Corsairs.

The Axis side was distinguished by four aircraft—the German Messerschmidt Bf-109 piston-engined fighter and Me-262 Schwalbe jet fighter; the Focke-Wulf Fw-190; and the Japanese Mitsubishi Zero-Sen.

While the Bf-109 was the foremost German fighter of the war, gaining special fame during the Battle of Britain, it had a major problem with its landing gear, which was narrow and spindly. In fact, 1,500 Bf-109s were destroyed in landing and takeoff accidents in a two-year period due to this weakness.

That didn't stop the Bf-109 from being the steed of Germany's top aces, such as Oberleutnant Erich Harmann—the world's top ace—who scored 352 confirmed kills flying the Bf-109. The Bf-109 was a superior fighter once airborne.

The Fw-190 was the Bf-109's radial-engined alternative. The Fw-190 proved to be the more versatile airframe, as well, and the aircraft was constantly modified to meet numerous missions. It started the war with a radial engine and finished it with an in-line engine and the ability to do 426 mph in level flight.

The Zero was a classic case of a fantastic fighter with a fatal flaw. The Zero was light, fast and maneuverable and gave allied fighters a bad time early in the war.

Unfortunately, in making it light, the Mitsubishi designers left out armor plating and self-sealing fuel tanks. Consequently, the Zero was vulnerable to even minor hits, which would turn it into a flaming coffin.

As the war went on, the Japanese tried to modify the Zero to meet changing missions. The modifications never succeeded in making the Zero better. The Japanese turned their attention to newer craft, and the Zero ended the war as the primary aircraft of the kamikazes.

The Me-262 was one of the first operational jet fighters in the world. Powered by two jet engines, it clipped along at 540 mph and was armed with four 30mm cannons. The Luftwaffe wanted it as a fighter. Adolf Hitler wanted it to carry bombs.

By the time the Luftwaffe sprang the aircraft free for fighter operations, it was a case of too little, too late. They gave allied fighters and bombers fits, but eventually fell prey to raids on their airfields and factories.

The World War II fighter was an example of how wartime speeds aircraft development. In a span of six short years, the air forces of the world had jumped from the biplane to the jet. The world of flight would never be the same.

Americans learn war tactics in the "school of hard knocks"

The first year of the war was a rude shock for some...

Shortly after dawn, Sept. 1, 1939, as German armored columns poured across their country's borders, Polish pilots took to the skies in their lightly-armed, obsolete high-winged fighters to intercept Luftwaffe bomber formations.

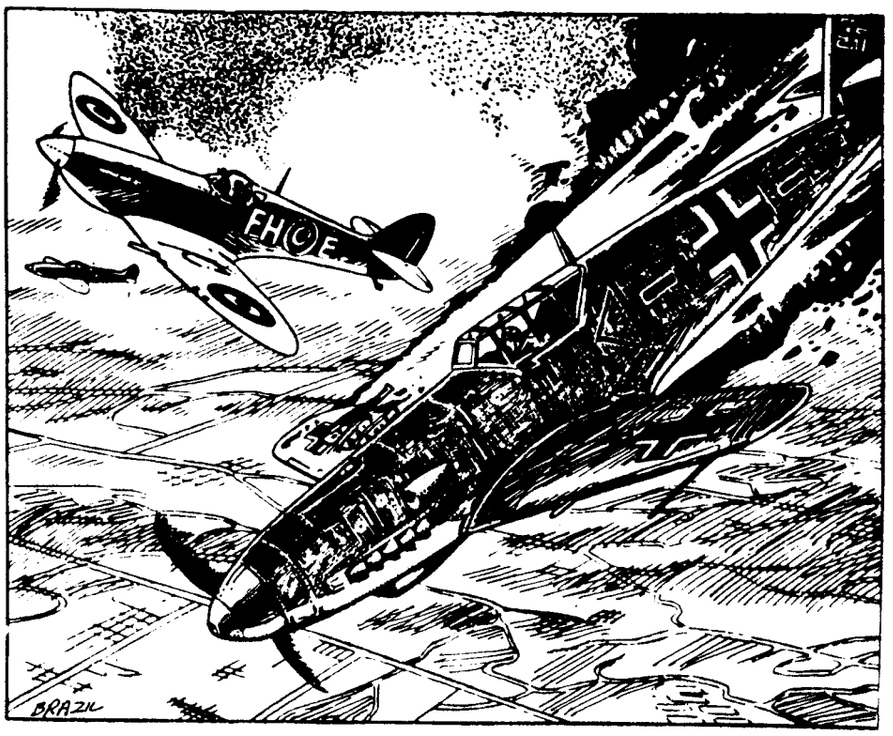
Before the morning was out, Lt. Wladimir Gyns had shot down two Dornier Do-17 bombers and Lt. Alexander Gabszewicz another. One of them had scored the first Allied kill of World War II.

The Luftwaffe's fighter pilots had two things going for them as the war began. First, they had the Messerschmidt Bf-109. It was fast, maneuverable, heavily-armed and the world's best fighter plane at the time.

Secondly, they had learned the lessons of air combat during Germany's involvement in the Spanish Civil War. Many of the Luftwaffe pilots had gained experience flying the Messerschmidt during that conflict.

Germany quickly rolled up the Poles, Dutch and Belgians, even though the small air forces of these nations battled courageously against the Luftwaffe's aerial blitzkrieg. It took the Germans 10 months, however, to beat France's Armee de l'Air and Britain's Expeditionary Force, before France surrendered and the British forces were evacuated.

British planes were like sitting ducks in their 'Idiots Row' formation.



Spitfire

The first year of the war was a rude shock for Britain's Royal Air Force. They'd developed a system of formalized, numbered flight formations which were supposed to ease the task of the squadron commander. He called out a number, the squadron rearranged its formation and carried out the prescribed attack, and then flew off victoriously.

But it didn't work that way. The Germans were particularly fond of the RAF's line-astern formation, used for attacking bombers. The Luftwaffe called it the idiotenreihe—or idiot's row—formation. When the RAF pilots lined up, they were sitting ducks for the German fighters who came screaming in on the flanks and rear.

Many deaths

It took many deaths before the British realized the German system was the best. The Germans used two two-plane elements as their basic combat formation. They were spread out loosely— about three aircraft lengths—in what was known as the "finger four" formation.

To visualize this, look at your right hand from the back. The middle finger would be the flight leader. The index finger represents his wingman, flying at a slightly lower altitude. The ring finger is the second element leader, slightly higher than the flight leader. And the pinky is his wingman, slightly higher than the second element leader.

The German formation is still the basis of fighter formations worldwide.

The Battle of Britain brought about the first changes to the complexion of the air war in Europe. The Bf-109 had to sacrifice some maneuverability to carry more fuel, just to carry the war across the English Channel. On the other side, the RAF's Spitfire, in its role as a point defense interceptor, traded range for more maneuverability.

The Germans now had the advantage only in a dive, where BF-109 fuel injection allowed it to push over and go. The Spitfire and Hurricane, with carburetors, suffered momentary fuel starvation while pushing over to go after them. Eventually, the British learned to half-roll at the start of the dive to maintain fuel flow.

While the British were winning the Battle of Britain, American liaison officers were passing lessons learned back to the Army Air Corps. Theoretically, the lessons were passed down to the pilots.

Russians use 'dog'

However, when the Japanese bombed Pearl Harbor and then went after the Pacific, theory didn't prove out. The Japanese Zero-Sen fighter was fast and maneuverable, like the Bf-109. It took a lot of hard knocks for the Americans to learn that the P-39 Airacobra and P-40 Hawk fighters had to avoid mixing it up with Zeros in a dogfight. Only by getting the height advantage and making hit-and-run diving attacks could they take on the Zero.

The P-38 Lightning—a twin-engine fighter with a twin-boom tail couldn't maneuver with the Zeros, but could out-climb them. By making repeated diving attacks and using the finger-four basic formation to the fullest, the P-38s began taking a heavy toll on the supposedly invincible Zeros.

Incidentally, the P-39 which was such a "dog" in the hands of the Americans was one of the best aircraft the Russians had. The Russians turned the tough little Bell fighter into a superb ground-attack machine. Guards Col. Alexander Pokryshkin, Russia's second-ranking ace with 59 victories, scored 48 kills flying P-39s. A number of his kills were attributed to ramming tactics, at which he was highly proficient.

The tide in Europe and Asia changed with the delivery of the two top American fighters of the war. The P-47 Thunderbolt— the largest single-seat, single piston-engined fighter ever built— carried eight .50 caliber machine guns and was superb in diving attacks, dropping like a lead-spitting rock through enemy formations. It wasn't maneuverable, but it could climb and dive with the best.

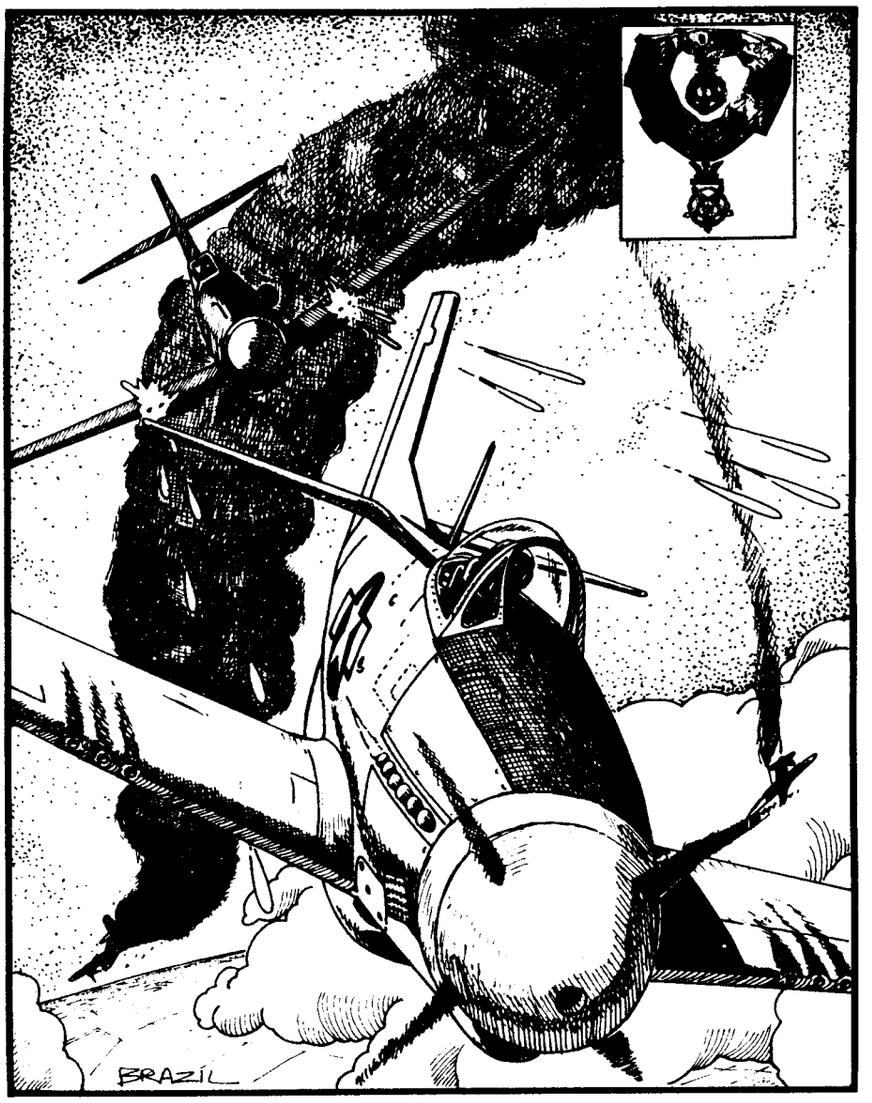
Steed aids pilots

The maneuverability champ was the P-51 Mustang. Fast, light and tremendously agile, the P-51 finally gave Army Air Forces pilots an eight-gunned steed which could turn inside the best enemy fighters and out-dive, out-climb and out-run them. With its range extended by droppable tanks, the P-51 was able to carry the war to the enemy's backyard.

The Germans tried to counter these aircraft with improved models of the Bf-109 and Focke-Wulf Fw-190, but were unsuccessful. The Me-262 Schwalbe (Swallow)—a twin-jet fighter—was brought into production, but even with the speed advantages jet propulsion brought, the skies over Europe swarmed with enough high-speed Allied fighters to smother the jets.

Supremacy sought

The Japanese had developed numerous successors to the Zero, but after American attacks began crippling the aircraft industry, few models were produced in quantity. The Japanese did make the first test flights of a Me-262 copy jet fighter— the day after the atomic bomb dropped on Hiroshima.



P-51

Had the Japanese not surrendered, both America and Great Britain were ready to escalate the fighter war. The Gloster Meteor jet fighter—the only allied jet to see operational use in the war, and then only to shoot down V-1 flying bombs—was ready to go into service with the RAF.

In America, the Lockheed P-80 Shooting Star had begun quantity production. A few were even demonstrated in the Mediterranean area after the German and Italian surrender.

World War II brought the piston-engined fighter to its peak of development, introduced the jet-engined fighter and hammered home the need for air supremacy in future conflicts.

'Red Baron'

But then, even the famous "Red Baron" of World War I knew that. Rittmeister Manfred von Richtofen wrote before his death, "The fighter pilots, have to rove in the area allotted to them in any way they like, and when they spot an enemy they attack and shoot him down; anything else is nonsense."

It's still part of basic fighter doctrine today.

Profits predict war strategy

World War II brought to fruition the principles of strategic bombardment championed by airpower prophets like Brig. Gen. "Billy" Mitchell and Italy's Maj. Gen. Giulio Douhet.

Both men preached that ground forces should defend and occupy territory, while offensive airpower brought an enemy to its knees.

Ironically, both of these airpower prophets died before seeing their theories proven.

During the late 1930's, the Germans surprised the Allied nations with the size and potency of their bomber force. Under the guise of high-speed civilian transports, they had developed two twin-engined medium bombers—the Heinkel He-111 and the Dornier Do-17—which would serve well throughout the war.

Unfortunately for the Germans, by the time of the Battle of Britain, the speed advantage no longer existed and the weak guns and armor of the Heinkels and Dorniers contributed to their being shot down.

Slab-sided, ugly, underarmed and tremendously rugged British aircraft

The Germans made a fundamental error in pouring extensive funding and materials into producing short-range medium bombers and fighters. Their best bomber was the four-engined Focke-Wulf Fw-200 Condor, a converted 26-passenger transport design with Berlin-to-New York range.

The Fw-200 wasn't produced in quantity. It became well-known to merchant convoys as a long-range commerce raider. Had it been built in large numbers, it would have posed a major threat to Allied supply lines and potentially could have sealed off Europe from major Allied military operations.

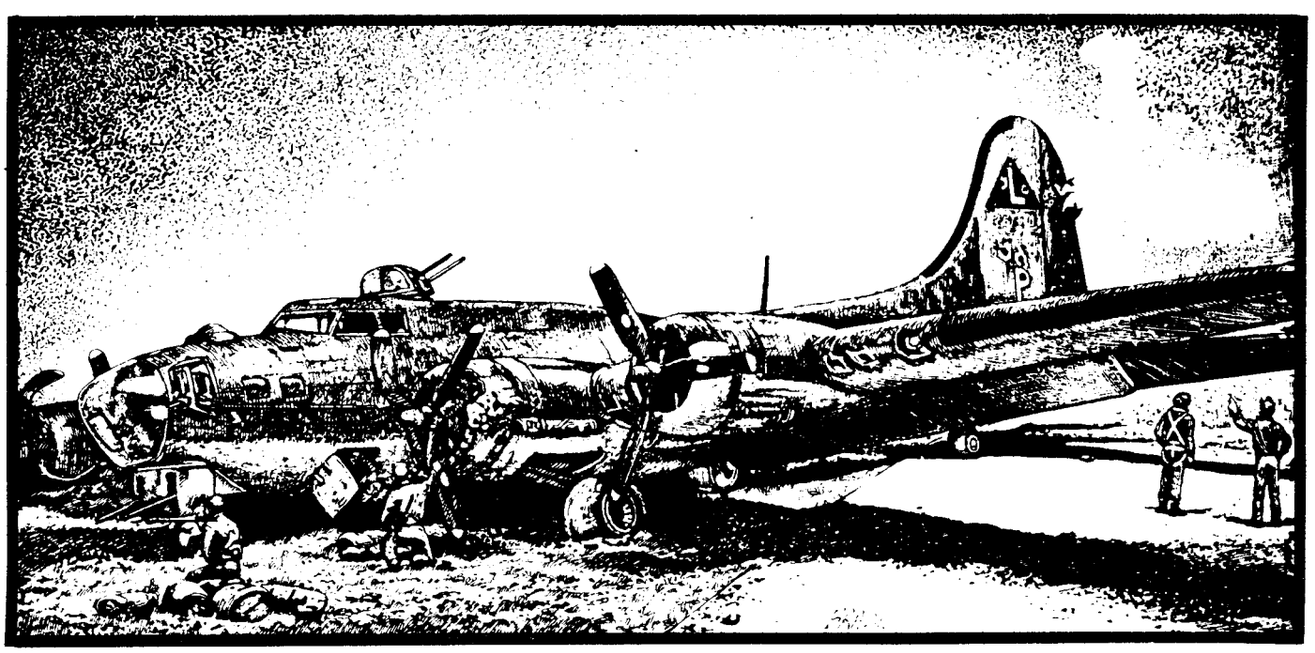
The British had a maverick stable of bombers at the outbreak of the war. With few exceptions, they were slab-sided and ugly, under-armed and tremendously rugged.

The RAF structured its air offensive on night bombing, using the bomber stream principle. Pathfinder aircraft took off first, followed at brief intervals by individual aircraft. The pathfinders marked the targets with flares, then every few seconds the bombers would individually pass over the target to drop their bombs and proceed independently back to Britain.

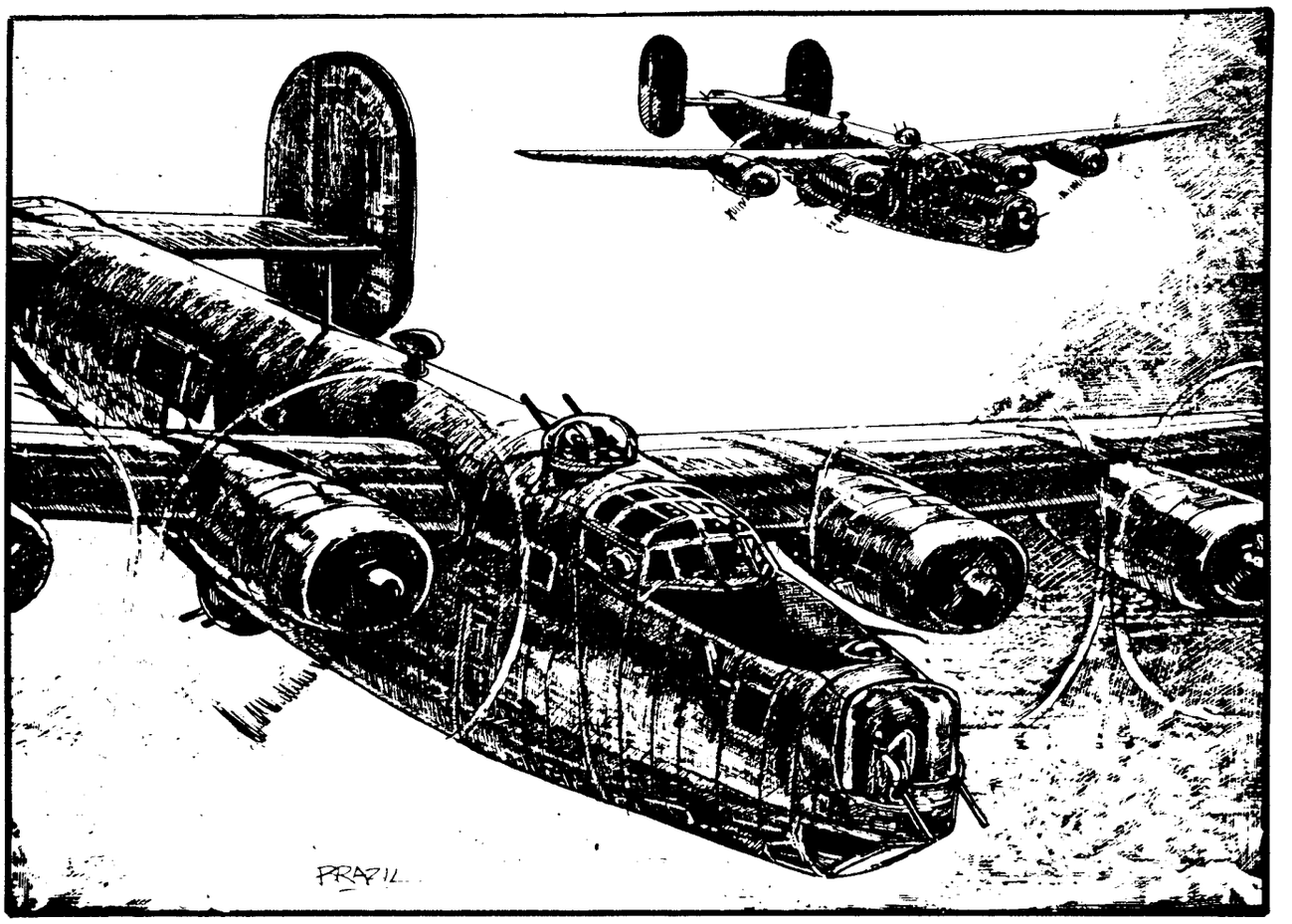
Amazingly, despite the split-second timing required to make these criss-crossing individual passes on the targets, mid-air collisions over the target were not as numerous as one might expect.

The American Army Air Forces, on the other hand, developed their strategic air bombardment doctrine based on pinpoint daylight bombing.

Rather than 200-mile-long streams of individual bombers flying independently, the AAF developed the combat box formation, where each aircraft provided defensive fire support for its mates.



B-17



B-24

Bombing was also done by formation, either individually as the crosshairs of the bombsight met, or all together on the signal from the group lead bombardier. Either way, the formation drop packed a more effective impact onto the target area than the single-airplane drops by the RAF.

To carry out the offensive, the AAF had two of the most effective bombers of the war. The B-17 Flying Fortress was the premier aircraft of the European offensive, carrying two tons of bombs on long-range missions of 1,500 miles, and up to 9,600 pounds on shorter missions.

Rugged and heavily-armed with up to a dozen .50 caliber machine guns, the B-17 was the mainstay of the European bombing offensive.

Overshadowed by the B-17 in the mind of the public, the B-24 Liberator was in fact produced in greater numbers, operated in more theaters and produced in a greater variety of versions than the B-17.

This exceptionally versatile four-engined heavy day bomber was also used for maritime patrol, anti-submarine operations, photographic reconnaissance and, in a transport version, for carrying passengers and freight.

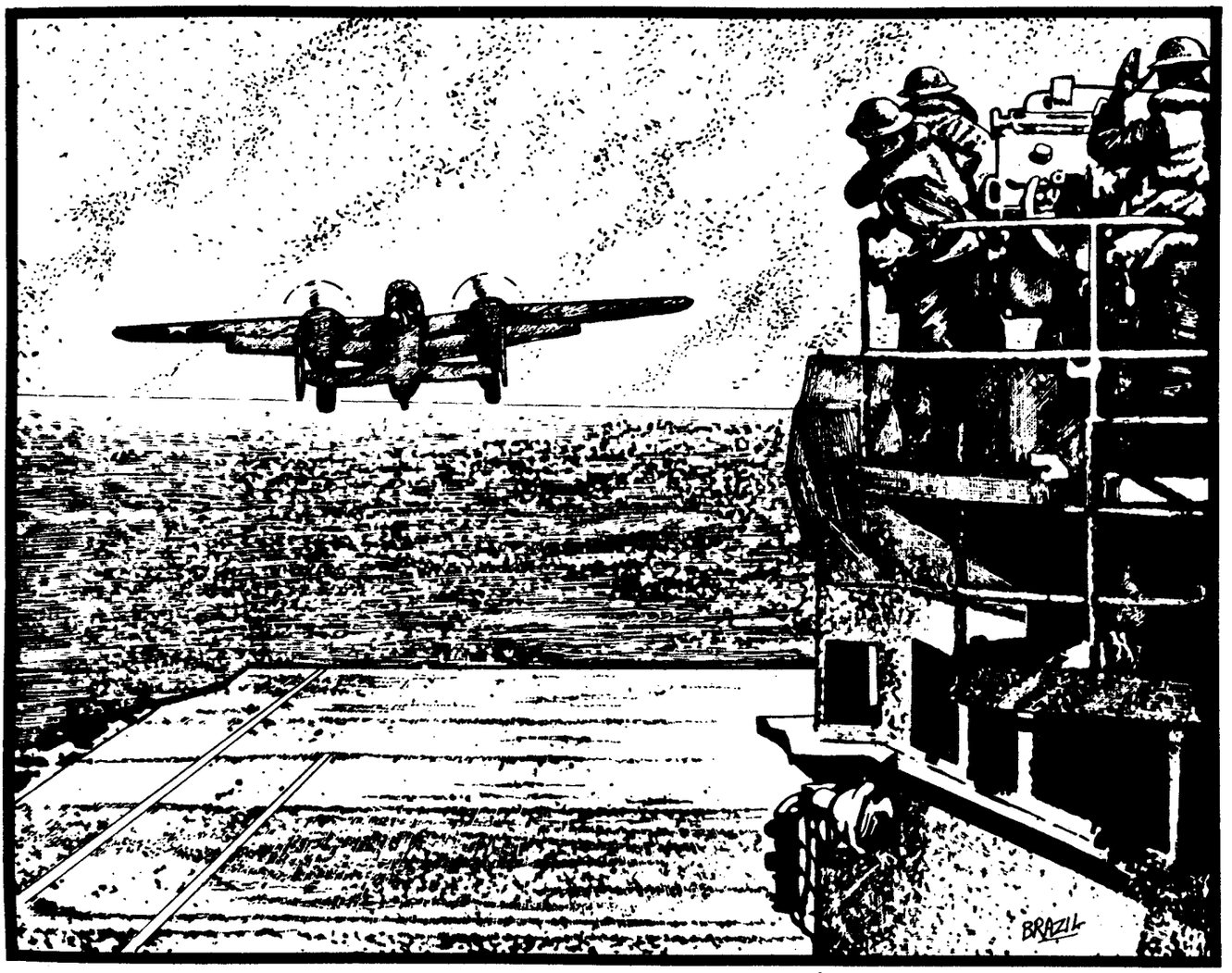
Boundless bombers prove vital to war effort

The high-winged, twin-tailed B-24 was built with high wingloading, which for a time limited its altitude. Once equipped with up-rated engines, the B-24 knew no bounds, and its longer range made it the primary bomber of the Pacific theater, as well as a major contributor to the European offensive.

The ultimate strategic bomber of the war was the B-29 Superfortress, a four-engined, extremely long range bomber with a pressurized fuselage capable of carrying six tons of bombs more than 3,700 miles.

By December 1943, AAF leaders decided the B-17 and B-24 could handle the European offensive, and turned the B-29 toward the Pacific's vast reaches. Staging from China and the Marianas Islands, the B-29s initiated the final push against the Japanese homelands.

Maj. Gen. Curtis E. LeMay, 20th Air Force commander, discovered Japanese air defense was almost non-existent, and ordered the B-29s to carry out the raids at low altitude with incendiary bombs. The raids devastated Japan's industrial capability. Finally, Aug. 6 and 9, 1945, B-29s delivered atomic bombs on Hiroshima and Nagasaki. Its resolve broken, Japan surrendered Aug. 14.



An aircraft takes off from a Navy carrier.

Navy digs in heels against AF

The senior leaders of the Army Air Forces must have sometimes regretted winning World War II.

When Japan formally surrendered Sept. 2, the Air Force had more than two million people in uniform.

Then the dam broke, in the form of demobilization.

Eighteen months after the war ended, the Army Air Forces had only 303,000 people in uniform,

It no longer had a five-star general in command, either. Gen. Henry H. "Hap" Arnold, who had so ably directed the Army Air Forces throughout the war, despite a heart attack, retired. Gen. Carl A. "Tooey" Spaatz assumed command on Feb. 15, 1946. General Spaatz had his work cut out for him.

As one of the visionaries who helped forge the air machine that won World War II, he had long been a proponent of an independent air force.

Now, the dream was within reach. The Joint Chiefs of Staff wanted a separate air force. The War Department wanted a separate air force. Most of the Congress wanted a separate air force. The president wanted a separate air force.

The Navy didn't like the idea at all. And they dug in their heels.

The Navy's basic objection was putting a secretary of defense between the Navy and the president.

President Harry S. Truman wasn't having any of this. He called the secretaries of war and Navy, and told them to work out an agreement. They did, and in February 1947, the National Security Act of 1947 went to the law makers. With some changes, the president signed the act on July 26.

The act created the Department of Defense, with Army, Navy and Air Force departments beneath it. The Navy was allowed to keep the Marine Corps and naval air units, while the Army Air Forces were transferred to the new U.S. Air Force.

The Air Force was born Sept. 18, 1947, when Senator Stuart Symington became the first Secretary of the Air Force.

Navy charges strategic bombing morally wrong and serves no purpose

The transfer was almost painless, thanks to prior planning by Army and Army Air Forces leaders. By June 30, 1948, more than 60 percent of the Army Air Forces had been transferred to the new department, and by July 22, 1949, tne transfer was complete.

The new Air Force was quickly confronted with its first big challenge, at the divided city of Berlin. The Russians cut off all rail, barge and highway traffic into the western-occupied zones of Berlin June 22, 1948.

There were two choices available: withdraw American, French and British troops and abandon the city to the Russians—or supply more than two million people by air.

The task initially fell to the U.S. Air Forces in Europe. Using C-47s and previously desk-bound pilots, USAFE delivered 80 tons June 26—and then sent out a call for help. By July 20, the airlift task force had 54 four-engined C-54s and 105 C-47s lifting 1,500 tons of necessities into Berlin each day.

Military Air Transport Service sent 72 more C-54s to Europe and the Navy contributed 24 C-54s to the cause. The British added several York transports and C-47s, boosting the daily capability by 750 tons.

Eventually, more than 200 C-54s were flying cargo to Berlin's three airports any given day. By mid-April 1949, the airlifters reached a daily peak of nearly 13,000 tons.

The Russians gave it up and ended the blockade May 12, 1949.

The airlift continued until Sept. 30, when sufficient supplies had been stockpiled in Berlin.

The joint airlift made 275,544 round trips to Berlin to deliver more than two million tons of supplies. Considering the number of flights made and the conditions under which they were flown, the safety record was amazing. Twelve airplanes crashed, killing 31 Americans.

While the successful airlift continued, things were heating up on Capitol Hill. An anonymous document was circulating around the legislature in early 1949 charging the Air Force's new B-36 bomber didn't meet the performance levels the Air Force was claiming. Coincidentally, the Navy's first "super-carrier" had just been cancelled by the Department of Defense.

Congress cleared up those charges in a series of hearings, then the Navy hit from another angle. They charged that strategic bombing was morally wrong and served no useful purpose; that the Air Force had neglected air defense and tactical air by pouring money into long-range bombers; and that the B-36 was a mistake. On the other hand, they argued, the aircraft carrier was a necessary weapon for the future and well worth the expense.

A battle was inevitable. The Air Force was trying to keep 48 wings in operation with funds for only 42. The Navy wanted its super-carriers. The Air Force won the fight, but the Navy wasn't a loser.

In August 1949, the Russians exploded their first atomic bomb. And back home, the need for a strong, strategic force became evident. Both the Air Force and the Navy would soon take active roles in the building of that force.

While the United States rushed to put its strategic forces in order to meet the new threat, things were happening in a far-off corner of the Pacific that would throw the whole issue into a cocked hat.

Trouble was brewing on the 38th parallel—in a divided country called Korea.

Trouble Brews in Korea

America thrust into another shooting war

North Korean forces smashed across the border into South Korea just before dawn on June 25, 1950. Less than five years after World War II ended, America was suddenly thrust into another shooting war.

Air Force F-82 Twin Mustangs from Itazuke AB, Japan, stood guard over the evacuation of American dependents from South Korea. The F-82 was two P-51 Mustang fuselages joined by a 10-foot stub wing and tail.

Two days after the invasion 1st Lt. William G. Hudson was flying his F-82 over Kimpo Airfield, where C-54 transports were loading passengers. In the other cockpit was Capt. Carl S. Fraser, radar operator and observer.

...the aircraft junkyards of the Pacific were humming

Lieutenant Hudson's four-aircraft flight spotted five Yak-11 fighters headed for the airfield. Within moments, the lieutenant had scored the first kill of the war and two other North Korean aircraft were going down in flames.

In short order, the aircraft junkyards of the Pacific were humming with activity as P-51 Mustangs were restored to top condition. For the ground-support role, the Mustang was unmatched. The F-80 Shooting Star and F-84 Thunderjet, also used for ground support, couldn't match the Mustang for payload and endurance.

In August 1950, Maj. Louis B. Sebille became the independent U.S. Air Force's first Medal of Honor winner. Leading a P-51 squadron against an enemy troop concentration, his aircraft was hit by ground fire. Mortally wounded, and swearing vengeance, Major Sebille brought his aircraft around for another pass. At full throttle, all guns blazing, he crashed his aircraft into the middle of the tanks, trucks and troops, causing heavy enemy casualties.

As the war escalated, the North Koreans introduced the MiG-15 swept-wing jet fighter. On Nov. 8, 1950, lst Lt. Russell J. Brown, flying an F-80, managed to shoot down one of the faster, more maneuverable MiG-15s in the first all-jet dogfight in history.

MiGs swarm up in response to air attacks close to the Yalu

Slightly more than a month later, the first wing of F-86 Sabre jets had arrived from the United States and began knocking down MiGs. However, Communist China had entered the war and the ground battle soon jeopardized the airfields. The F-86s were then relocated to Japan.

This relocation gave the MiGs a wider freedom of action between the Chong-chon and Yalu Rivers in the northwestern area of North Korea.

This area soon became known as "MiG Alley," where the MiGs could fight and easily run away to their politically-established sanctuary in China just north of the Yalu.

By the end of May 1951, however, America had its first jet ace. Maj. James Jabara downed six MiGs in two months—then was pulled out of combat and returned to the states to help whip up public support for the war.

A World War II fighter pilot, the fiesty major finally managed to get back to Korea in 1953 and destroyed another nine MiGs.

Things began to heat up in the icy skies over North Korea. For a time, the MiGs were aggressive, venturing south to strike at bomber formations defended by F-80s and F-84s and jumping ground-support aircrart. The older, straight-winged F-80s and F-84s fared well against the fast, swept-winged MiGs, however.

In one engagement, 25 MiGs attacked 33 F-84s. Three MiGs went down, with no F-84 losses. On the other hand, MiGs shot down a dozen fighter-bomber aircraft during the last months of 1951. This threat brought a second wing of F-86s into action.

The MiGs formed "trains," huge line formations, which broke through the Sabre protective screens and then roved the front lines looking for bombers and fighter-bombers. After the enlarged force of F-86s shot down 31 MiGs in one month, the "trains" broke into smaller formations and stayed farther north.

The F-86s continued to carry the air war right up to the banks of the Yalu. Although heavier than the MiG and not as maneuverable, the F-86 had the advantage of being piloted by better-trained, and often, more experienced, pilots.

In the fall of 1952, the MiGs swarmed up again in response to air attacks close to the Yalu. This time, the Americans had the new F-86F Sabres, with more powerful engines and more maneuverability.

Battling in MiG Alley

It was Sabres-63, MiGs-6 in September and the MiGs stayed in China to lick their wounds for most of the winter.

American psychological warfare officers began a propaganda campaign, taunting, "Where is the Communist Air Force?" The MiGs finally came out of hiding in May 1953. The Sabres shot down 56 MiGs while losing only one Sabre, whose pilot was rescued.

May 1953 was also the end of combat for Maj. Joseph McConnell Jr., who in four brief months shot down 16 MiGs to become America's top ace of the war. A little more than a year later, he died in the crash of an F-86H Sabre while testing an improved version of the aircraft that carried him to fame.

The MiGs swarmed up again in June, and the Sabres had their best month ever, shooting down 75 MiGs without a single Sabre lost.

The new F-86s could fly higher than the MiGs, and this forced the MiGs to duck under clouds and try to sneak down MiG Alley at lower altitudes, hoping to get to the fighter-bombers. The Sabres now initiated most air combats, and the MiGs suffered accordingly.

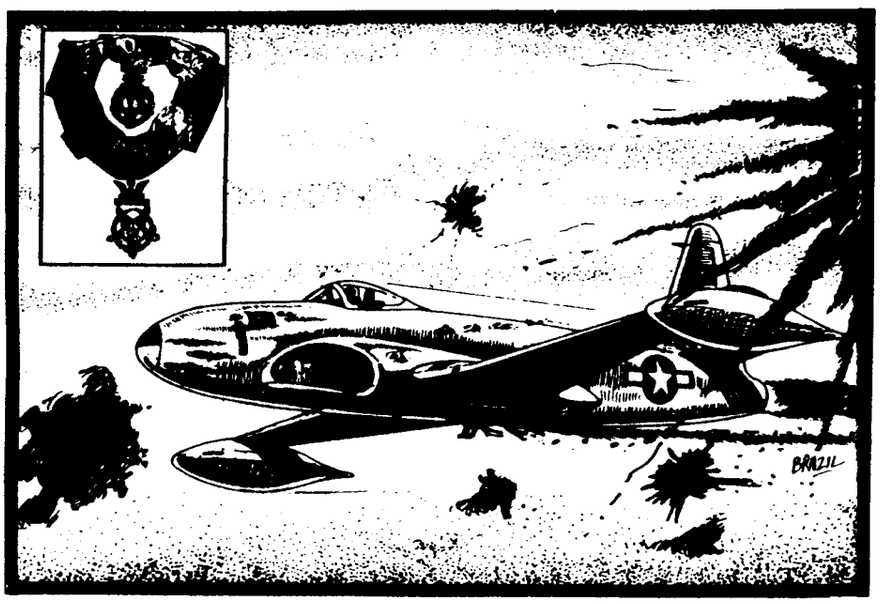
The MiGs risked few engagements the next month, and only 32 aircraft went down before the cease-fire went into effect July 27.

At twilight July 27, 1953, up along the Yalu, Capt. Ralph S. Parr spotted an Ilyushin transport. He immediately sent it down in flames. It was his 10th kill—double acedom—and the last aircraft shot down in the war.

Korea—the war that wasn't a war—firmly established the jet fighter in the minds of the public.

The new Air Force had come of age.

MacArthur disagrees with strike strategy against North Korea



F-80 Shooting Star

Air Force learns WWII lessons well

Not all of the Korean War was fought in "MiG Alley."

Although the Air Force's primary mission during the war was to gain air superiority over the battlefields, its secondary task was to prevent the enemy's movement of troops and supplies to the battlefront.

Experience in World War II had shown the best way to reduce an enemy's attack capability was to destroy his war supplies at the point of manufacture. The next best way was to cut off the supply routes to the battlefield, then knock out the manpower and supplies when they were held up by these choke points.

The North Koreans launched their attack June 25, 1950. Within two weeks, two Strategic Air Command B-29 groups were in the Far East.

From the start, the B-29 groups had orders from U.S. Air Force headquarters to strike North Korea's war-production industries and major transportation centers. The theater commander, Gen. Douglas MacArthur, didn't agree.

Because the ground situation was so perilous, he ordered the B-29s to be used against the North Korean battlelines and bridges within a few miles of the front.

While this relieved some of the immediate pressure on the American combat forces, Air Force planners knew such actions were a temporary solution, at best. Troops and supplies still poured down into South Korea.

Finally, toward the end of July 1950, the Air Force was allowed to unleash its airpower on North Korea. B-29s struck hard at North Korea's bridges and railway marshalling yards. F-51 Mustangs, F-80 Shooting Stars and F-84 Thunderjets of the 5th Air Force were turned loose on daylight armed

reconnaissance missions, to strike the enemy whenever and wherever he could be found.

The World War II A-26 Invader, redesignated B-26 when the B-26 Marauder was dumped from the inventory after the war, became the primary night intruder. Painted black, the twin-engined, heavily-armed B-26s roamed behind the enemy's battle areas at night, blasting troop concentrations and providing short-notice support to ground positions under attack.

The B-29 effort was shifted to North Korean industry, and, although incendiaries were forbidden for political reasons, the B-29s conducted a campaign similar to their attacks on Japanese industry in World War II. By Sept. 15, 1950, North Korea's war industry no longer existed.

War at sea

That same day, X Corps made an amphibious assault over the seawall at Inchon, South Korea. Within days, C-54 and C-119 transports were unloading troops and supplies at Kimpo Airport, captured in the assault.

The B-29s and B-26s and the fighters were focused on the battlefront and choke points again. By Sept. 28, airplanes were returning with bombs still on their shackles. There were no worthwhile targets left. South Korea was effectively cleared of North Koreans.

The allied forces turned north. They quickly captured Pyongyang, the North Korean capitol. Oct. 20, 1950, the C-119s and C-47s of the Far East Air Force's Combat Cargo Command dropped almost 3,000 troops north of Pyongyang to entrap North Korean forces.

In November, when the Chinese Communists entered the war, the B-29s made a two-week maximum effort in the area between the Yalu river bridges and the battlefront, with orders from General MacArthur to destroy every means of communication, every factory or installation, and every city or village. They were finally authorized to use

Second highest scoring pilot in the Korean War—Major James Jabara

incendiaries, and in short order, the zone was reduced to rubble and four broken bridges hung into the Yalu.

Even as the intense pressure of the Chinese forces drove the Americans and their allies southward on the ground, the strategic air offensive continued, blasting railways, roads and bridges to cut the flow of manpower and supplies to the front.

Throughout 1951 and most of 1952, the enemy's lines of communition and troop concentrations received most of the attention from air forces. The Chinese tried to rehabilitate North Korea's airfields, but they were quickly cratered and destroyed. The Chinese abandoned their efforts.

Lights out

The effort shifted in mid-1952, with strikes against the North Korean hydroelectric plants. Within weeks, North Korea was without electricity.

The bombers and fighter-bombers began making massive strikes against North Korean industry again, which had partially recovered from the 1950 attacks, and against towns being used as vehicle repair stations, supply dumps and troop billets. North Korea began to resemble a moonscape.

Agriculture was the only North Korean Industry that had escaped major damage, but that changed in May 1953.

On May 13, 59 F-84 fighter-bombers hit the Toksan irrigation dam, breaking the dam, flooding out rail lines and highways and causing widespread damage. May 16, 90 F-84s hammered the Chasan irrigation dam, again devastating wide amounts of territory. North Korea's ricelands -- heart of their economy—would take years to restore.

The Communists had tasted total war and found it bitter. They quickly signed truce agreements.

Wanting to end on some note of victory, however, they launched another major ground attack in mid-June. Air Force and Navy aircraft laid down a curtain of fire to allow the allied troops to fall back and establish a new main line of resistance.

Bitter war

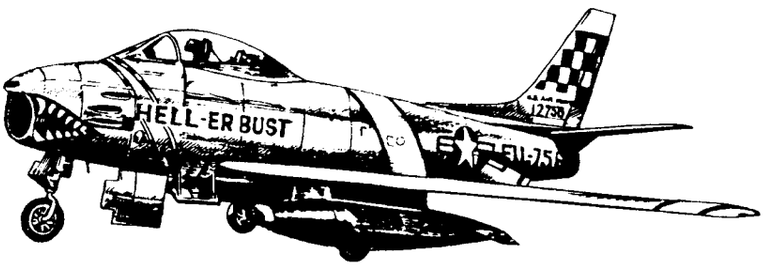
Under the terms of the truce, the Chinese weren't allowed to bring aircraft into North Korea after the cease-fire went into effect. To ensure this agreement would be honored, the Far East Air Force went to work to make sure there were no airfields left in North Korea capable of accepting aircraft.

One airfield, Uiju, had MiGs in its revetments. There were no other Communist aircraft anywhere else in North Korea. The B-29s knocked out the 36 MiGs with fragmentation bombs, then proceeded to crater and level every North Korean airfield. By July 27, the last day of the war, every North Korean airfield was totally unserviceable.

At 9:36 p.m., July 27, 1953, a B-26 dropped the last bombs of the Korean war. At 10 p.m., the cease-fire took effect.

The Air Force showed it had learned the strategic bombardment lessons of World War II well. Given a free hand, it could reduce an enemy's war-making capability to rubble.

...quantum leaps, explosive change, unmatched military power.



F-86

Air Force enters an exciting era

To the newly-independent U.S. Air Force, the 1950s wasn't a decade—it was an explosion!

For one thing, the Air Force doubled in size—from 411,000 in 1950 to 814,000 by the end of 1959.

The skies told the real story, though. In 1950, the fastest operational aircraft was the F-86 Sabre, with a top speed of 650 mph. By the end of the decade, the F-105 Thunderchief was traveling at over 1,400 mph. This was slightly faster than the F-106 Delta Dart.

It was an exciting time to be in the Air Force.

The various aircraft manufacturers were going all-out to expand the horizons of flight—ever-faster, ever-higher. This resulted in one new aircraft after another.

The Korean War, at the beginning of the decade, was a mixed blessing. While it accelerated production rates for airplanes already in the inventory, it also led to funding shortages that delayed or killed many promising aircraft programs.

The F-80 Shooting Star was one of the three primary fighters on hand when the war started. Of 1944 vintage, the six-gunned fighter was about 100 mph slower than the North Korean MiG-15. The F-80 was quickly relegated to bomber escort and close air support tasks.

The F-84 Thunderjet, of 1946 vintage, was designed as a bomber escort. Also slower and less maneuverable than the MiGs, the F-84 proved unsuccessful as a bomber escort, but found its forte in close air support missions.

The top-of-the-line fighter, the F-86 Sabre, was heavier and not as agile as the MiG-15. However, the MiG-15 gave up things like self-sealing fuel tanks and armor, which the F-86 had. The F-86s steadily engaged the MiGs in situations where the F-86s were out-numbered and at the very limits of their combat radius—and still shot the MiGs down at a ratio of 14 MiGs for every F-86 downed.

The air war prompted some new interest in the research and development area.

...F-86s were outnumbered and at the very limits of their combat radius but...

The F-80 received a few modifications, but the trainer version of the Shooting Star, the T-33, grew into a new interceptor aircraft—the F-94 Starfire. A few F-94s even made it to Korea, where as night-fighters, they were credited with four Communist aircraft.

The F-84 received a new wing as an experiment. It worked. The F-84F, with swept wings, soldiered on with the tactical air forces through the 1960s.

The F-86, as the primary air superiority fighter, received primary attention. Modifications to gunsights, wing leading edges and engines resulted in the F-86F, an aircraft with more altitude, more maneuverability and better gunnery. It chased the MiGs from the air combat arena.

At the end of the Korean War, the Air Force was flight testing the F-86H Sabre, with a new engine, thicker fuselage, new canopy and four 20mm cannons, replacing the plane's six .50 caliber guns.

Another F-86 variant, the F-86D, began production toward the end of the war. Radically modified from the basic F-86, the "Sabre-Dog" added a nose radome, afterburning engines, and dropped its guns. Instead, it carried a tray of 24 Mighty Mouse 2.75-inch unguided rockets which were lowered from the belly and fired at close-range.

The F-89 Scorpion, the first interceptor to carry a nuclear missile, phased into service during Korea and was phased out as quickly as possible. The F-94C, a rocket-firing version of the F-94, came into service in small numbers and then began phasing out. There was something better waiting in the wings.

1954 was a spectacular year for the Air Force. During that single year, the Air Force's fighter force added the F-100A Super Sabre, the first fighter to fly faster than sound in level flight; the F-101A Voodoo, a bomber escort aircraft to replace the F-84; the F-102 Delta Dagger, a delta-winged interceptor; and the F-104A Starfighter, a stubby-winged, missile-like fighter and interceptor.

The following year, the F-105B Thunderchief was added to the tactical inventory as a low-level supersonic fighter-bomber, capable of carrying a nuclear bomb in its internal bomb-bay. A year later, the F-106 Delta Dart, the follow-on variant of the F-102, joined the Air Force inventory.

On the bomber side, the Air Force's primary "heavies" as it entered the decade were the B-29 Superfortress of World War II fame, an up-engined B-29 called the B-50, and the B-36 Peacemaker, a huge intercontinental bomber with six piston engines on the back edge of the wings and four jet engines slung beneath the wings.

However, in December 1947, a four-engined bomber with swept wings and an unusual bicycle landing gear had made its first flight. The jet-engined B-47 Stratojet took over much of the B-36 mission, deployed to foreign bases to offset the range advantage of the B-36.

Air Force gets Jupiter program from Army—Air Force takes step into the future.

The B-36 still reigned supreme as the long-distance heavyweight—until a new Boeing design came off the drawing board. The B-52 Stratofortress was a swept-winged, eight-engined jet bomber with intercontinental range. The Convair people took a look and built the XB-60 - a swept-winged, eight-jet version of the B-36. It was a good try, but Boeing won the contest.

Three years later, in 1955, the Air Force finally matched its jet bomber force with a jet-engined tanker—the KC-135 version of the Boeing 707 intercontinental transport. The Air Force still had KB-50 Superfortress tankers on hand, as well as the KC-97.

In 1956, the strategic bombardment side entered a new era with the first flight of the B-58 Hustler—a delta-winged, supersonic medium bomber that looked and flew like an oversized fighter.

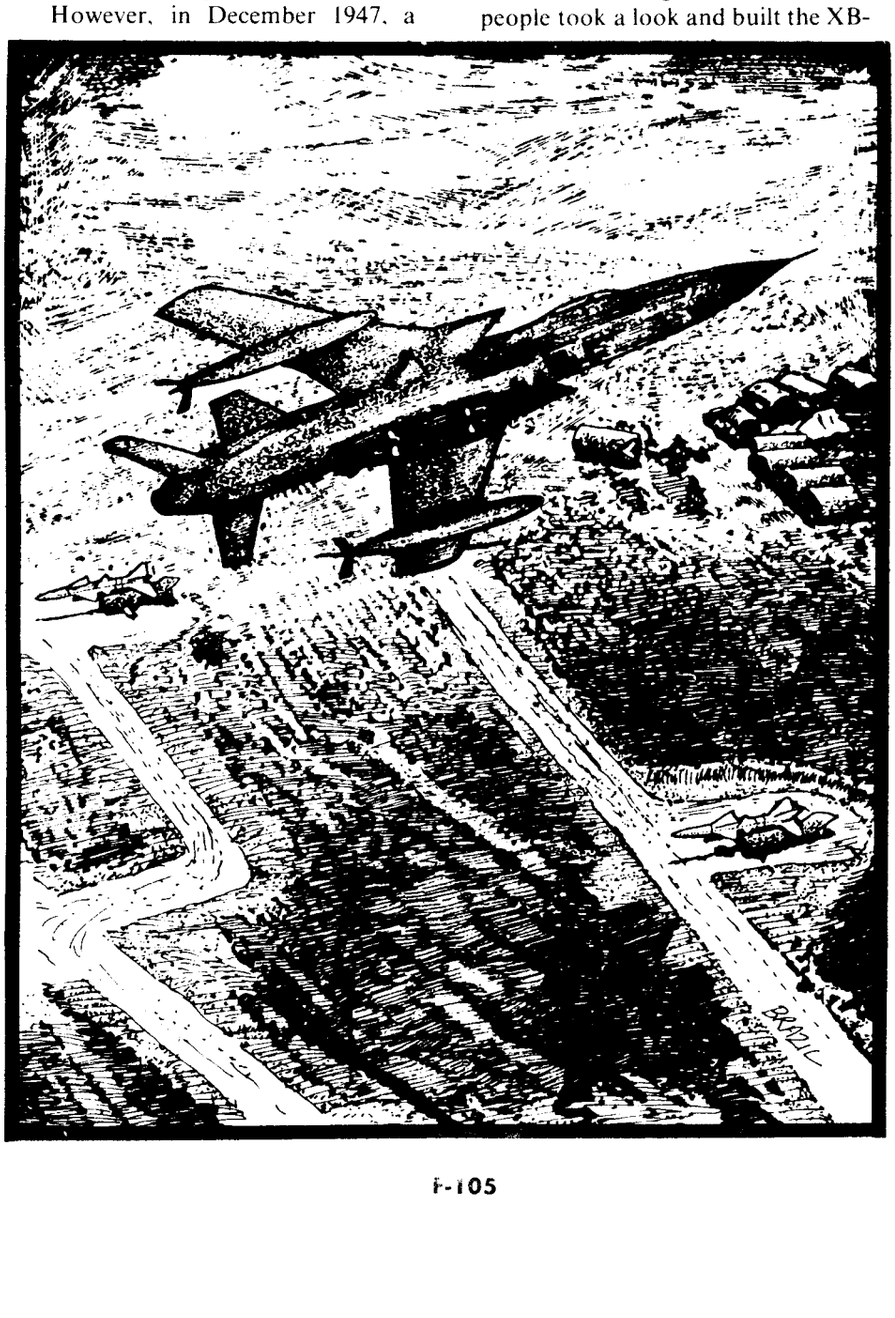
The air cargo side of things benefited from the 1950s, as well. Along with the C-135, the Air Force introduced the C-123 Provider for short-field operations, then quickly followed it with the turboprop C-130 Hercules. Heavy-lift capability was provided by the C-124 Globemaster and C-133 Cargomaster.

The Air Force took its first major step into the future in 1951. That was the year the first B-61 Matador was launched. Described as a pilotless bomber, the Matador was, in fact, the Air Force's first strategic missile.

The Army lost out in a bid for its own long-range nuclear force. The Defense Department transferred the Jupiter program to the Air Force, and limited Army missiles to 200-mile range.

As the decade closed, the Thor intermediate-range ballistic missile became operational in the United Kingdom. And at home, the Atlas intercontinental ballistic missile was declared fully operational. 1959 also marked the first launch of a Titan liquid-fueled intercontinental missile, and the first launch of a solid-fueled Minuteman intercontinental missile.

The 1950's was a decade of explosive change, quantum leaps in technology and virtually unmatched military power.



F-105

Vietnam: A personal war

The early air war in Vietnam was an intensely personal one. It was a war of squad tactics on the ground, and two-plane flights of aircraft pursuing shadows flitting through the dense jungles below.

It was a war where aircraft returned from missions with crossbow arrows sticking from their wings or holes from lead musket balls.

Detachment 2-A of the 4400th Combat Crew Training Squadron arrived at Bien Hoa AB, Republic of Vietnam, on Oct. 11, 1961. The 151-man detachment, known by the code name FARM GATE, was on a 179-day temporary duty assignment.

The detachment had 16 aircraft. Eight were modified T-28D Nomad trainers. The Nomads had hard-points on the wings to carry bombs, and carried two .50 caliber machine gun pods which were bolted under the wings.

The other eight aircraft were on their third war. Four were SC-47 Skytrains, the military version of the DC-3. The others were B-26s, resurrected from aircraft graveyards where they were stored after Korea. The twin-engined B-26s could carry eight .50 caliber machine guns in the nose and bombs or rockets under the wings.

The detachment's mission was to train the South Vietnamese air force. Vietnamese crewmembers sat in one seat, Americans in the other. Since the targets shot back, the desire to learn was intensified.

To make the job of mission coordination easier, a detachment of the 507th Tactical Air Control Group came in from the United States and set up a tactical air control center.

The FARM GATE people added aircraft to their number each time crewmembers and support technicians rotated from the squadron's headquarters at Hurlburt Field, Fla.

As the number of American advisors to Vietnamese army units grew, so did the need for air transport. Squadrons of C-123 Providers began trickling into the country. Bearing such picturesque names as "Harry's Hog-Haulers," and "The Century-Series Spam Cans," the short-takeoff-and-landing transports carried almost anything, from troops and ammunition to cows and cans of evil-smelling fish sauce, a staple of the Vietnamese diet.

The T-28s and B-26s bore the brunt of the war effort for nearly two years. But, the T-28s were inadequate in terms of payload and loiter time, and the wings on the B-26 were showing signs of structural failure.

A rapid search of the aircraft graveyards was made. The Air Force wanted to introduce jet attack aircraft, but the 1954 Geneva Accords that separated the two Vietnams prohibited such an escalation

Finally, the choice was made: The A-1 Skyraider. Built for the Navy at the end of World War II, the Skyraider had done yeoman service in Korea. Powered by a single piston engine, the A-1 carried more bombs than a B-17 and had four 20mm cannon in the wings.

The South Vietnamese air force received single-seat Skyraiders, known as A-1Hs. U.S. pilots received the twin-pilot version—keeping in mind their training role—known as the A-1E.

The U.S. Navy, beginning its first tentative commitments, dug its A-1s from the boneyards and began using them from aircraft carriers.

The growing air commitment swamped the South Vietnamese forward air control capabilities. In response, the 19th Tactical Air Support Squadron arrived in Vietnam in June 1963.

The squadron was immediately dispersed throughout Vietnam. It had 22 0-1E Bird Dogs and 44 pilots

Since there were no fixed battle lines, forward air controllers were needed to find the enemy and bring fire on him, while avoiding civilian targets.

The forward air controller soon became a legendary figure. His 0- carried 2.75 inch smoke rockets fo marking targets. The plane had n armor-plating, and no offensiv armament. The FAC flew low— often at tree-top level—and slow looking for evidence of the elusiv enemy.

When the enemy was spotted, th FAC rolled in and triggered a smok rocket, using his "grease-penc gunsight"—a simple dot or X mark ed on the inside of his windscree with a china marking pencil. The dc system was extremely accurate, sinc the pilots flew the aircraft severa times a day and customized the dots to their own heights and sea positions. One pilot reported

...mail was delivered and picked up and a bucket

picked off a three-man guerrilla squad with three rockets—saving the fighter-bombers a mission.

If the target was enemy troops attacking a village or convoy, the forward air controller often laid his life on the line until fighter aircraft arrived. The FAC would drop low to fire his M-16 or throw hand grenades at the enemy.

FACs were among the most-wounded and most-decorated pilots of the war. Since they flew several sorties a day, checking their assigned areas for suspicious activity, many accumulated nearly a thousand sorties during a one-year tour of duty.

Beginning in 1963, a new weapon entered the air war. The C-47, the "Grand Old Lady of the Skies," donned brass knuckles as the AC-47— "Puff, the Magic Dragon."

The concept stemmed from the memory of a pilot who'd been stationed in South America. At one remote place in the Andes, mail was delivered and picked up by an airplane with a rope and bucket. The aircraft went into a pylon turn, the bucket was let down, and the mail was quickly exchanged, as the pylon turn kept the bucket steady at the end of the rope.

The pilot conceived of replacing the rope with a stream of fire. Initial tests over the Gulf of Mexico, using a T-29 with three .50 caliber machine guns, proved the validity of the idea.

A General Electric adaptation of its 20mm Vulcan rotary cannon was hurriedly designed to fit the standard 7.62mm (.30 caliber) rifle round. Since there weren't many T-29s, but numerous C-47s in the aircraft graveyards, the C-47 was selected.

Firing as fast as 6,000 rounds per minute, the G.E. "miniguns" made night attacks on hamlets sheer hell for the Viet Cong. Able to cover wide swaths with streams of tracer fire, AC-47s dropped flares and then

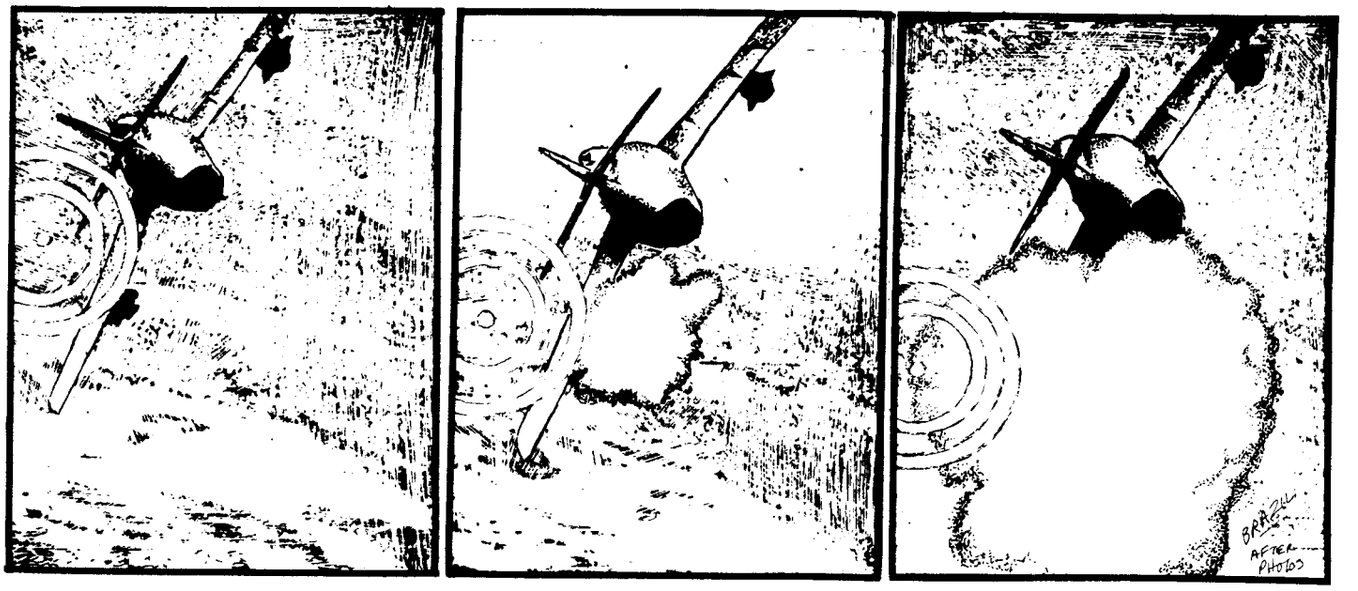
Major Bernard F. Fisher, an A-1E pilot, earned the Medal of Honor for his daring rescue of a fellow airman

laid down area coverage against the VC.

The concentrated fire, plus the psychological effect of seeing virtual tongues of tracer fire streaming down from the skies, stopped many VC attacks.

In 1964, however, it became apparent that North Vietnam was preparing to launch a major campaign to capture its southern neighbor. Main-force North Vietnamese Army battalions and regiments began appearing in the south. The Viet Cong were receiving better, more modern arms and equipment, and started strikes against American airfields.

After a particularly-damaging attack against the airfield at Pleiku, the Air Force finally got the nod to bring in the jets. B-57 Canberra medium tactical bombers were soon deployed to Vietnam.



An F-105's gun camera records the death of a MiG-17 over North Vietnam.

Battles rage over skies of Vietnam

The United States wouldn't send jet combat aircraft into Vietnam during the early 60s. U.S. policymakers decided the 1954 Geneva Accords kept them from doing so.

The United States reversed that decision in 1964, however.

Several factors brought the turnabout. First, there just weren't enough propeller-driven combat aircraft to go around.

The T-28D Nomad, a converted primary trainer, could not carry enough bombs or guns. The B-26 Invader, a World War II and Korean War stalwart, was withdrawn from combat due to structural failure.

The only prop-driven combat aircraft of value was the A-1 Skyraider, a World War II-era "flying dump truck" built for the Navy and used extensively in Korea. A superb aircraft, it carried more bombs than a B-17 and toted four 20mm cannon.

Yet, the A-1 had two failings—it couldn't fly high enough or fast enough to avoid antiaircraft fire, and there weren't enough Skyraiders to fill the demands. The Air Force, Navy and South Vietnamese were all flying them.

A second factor in the decision was the North Vietnamese acceptance of 34 MiG-15 and MiG-17 jet fighters from China. The jets were potentially harmful to the slower aircraft being used in the south.

The biggest factor, however, was the North Vietnamese force buildup in South Vietnam. In May 1964, the Joint Chiefs of Staff proposed that American air forces strike North Vietnam to take some of the military pressure off the south. Following the Tonkin Gulf incident in August 1964, jet combat aircraft poured into South Vietnamese airbases, hastily expanded to take the jets.

Antiaircraft fire proved to be the deadliest threat to American aircraft...

The American order of battle included F-102 Delta Daggers on runway alert for air defense, F-100 Super Sabres and F-105 Thunderchiefs for attack and RF-101s for photographic reconnaissance. Or, to use the pilot parlance, "Dueces, Huns, Thuds and Wun-Oh-Wonders."

Along with them came some B-57 Canberras, light tactical bombers adapted from a British design, some F-104 Starfighters with limited use in the air-to-ground role, and KC-135 Stratotanker aerial tanker aircraft. These forces were spread throughout Southeast Asia, including a major, but unpublicized, deployment throughout Thailand.

President Lyndon B. Johnson authorized Operation Rolling Thunder in February 1965, an eight-week campaign against the North. The idea was to reduce North Vietnam's war-making capabilities to rubble and cut its lines of communication with the forces deployed in the south.

The first raid was against the Xom Bang ammunition depot March 2, 1965. The strike force consisted of 44 F-105s, 40 F-100s, 20 B-57s, seven RF-101s and a dozen KC-135s. The South Vietnamese struck the Quang Khe naval base at the same time with 19 A-1 Skyraiders.

Four American aircraft were lost, three while attacking North Vietnamese antiaircraft artillery positions. Antiaircraft fire proved to be the deadliest threat to American aircraft throughout the war.

The raids continued—with different tactics—under the personal

Many were lucky enough to be plucked from the forest... others were not.

management of the president and senior defense officials. They spelled out targets, take-off times and even types of ordnance to be used.

April 4, 1965, Zinc Flight, four F-105s from Korat RTAFB, Thailand, were en route to the Thanh Hoa highway and railroad bridge 70 miles south of Hanoi. Zinc Lead and Zinc Two didn't make it.

Ten miles south of the target, two light-gray MiG-17s with Communist Chinese markings jumped the flight, opened up with cannon fire and knocked down the bomb-laden flight leader and his wingman. Both pilots were lost.

The North Vietnamese, using the ground-controlled intercept and hit-and-run tactics that were their trademark, had drawn first blood.

MiG attacks continued in this pattern. Their habit was to hit the last flights out of a target area when they'd be low on fuel and often suffering from antiaircraft damage. Taking advantage of this, four F-4C Phantom aircraft, new to Thailand, delayed their take-offs by 20 minutes, on one particular mission July 10, 1965.

The four F-4Cs followed the F-105 strike flights and F-4C escorts, to make the North Vietnamese ground controllers believe they were the last F-105 flight into the target area. It worked.

Two MiG-17s attempted to sneak up on the flight. In a matter of minutes, Capts. Kenneth E. Holcombe, Arthur C. Clarke, Thomas S. Roberts and Ronald C. Anderson became the first MiG-killers of the Vietnam war.

The war over the north became deadlier two weeks later. Just west of Hanoi, on July 24, a speeding shape, like a flaming telephone pole, marked the demise of an F-4C and the introduction of the surface-to-air missile to the North Vietnamese defensive system.

A pattern had been set. F-105s and F-4s, laden with bombs, rockets and missiles, took off from their bases in Thailand. Over Laos, they topped off their tanks from orbiting KC-135s and headed for their target areas in North Vietnam.

Specially-equipped two-seater F-105s attacked antiaircraft and missile sites in the target area, while EB-66 Destroyer aircraft jammed the enemy's radar and communications. The strike aircraft came in and laid down their ordnance, while F-4s orbited overhead for protection from MiGs.

The fighters flew a harrowing gauntlet of antiaircraft fire, missiles and MiGs. Those who made it, topped off again from the tankers and headed back to Thailand.

Those who didn't, left a trail of parachute canopies, squalling emergency locator beacons and smoking holes across North Vietnam. Many were lucky enough to be plucked from the forests and karst outcroppings of such places as Thud Ridge, Banana Valley and the Gorilla's Head.

Many more were not so fortunate, joining the growing ranks of prisoners of war in the People's Republic of Vietnam.

The participants changed occasionally during the Rolling Thunder campaign of 1965-1968, and the Linebacker I campaign of May to October 1972. The MiG-17s gave way to MiG-21s and the F-4Cs gave way to gun-equipped F-4Es, but essentially, the air war followed the same game plan.

Linebacker II, a 12-day campaign which began Dec. 18, 1972, was designed to convince the North Vietnamese to return to the peace table. It did.

The heart of the strike force this time wasn't F-105s. It was eight-engined B-52 Stratofortresses, streaming in on high-altitude bombing runs in the Hanoi area—"going Downtown." F-llls from the Combat Lancer task force hit airfields and missile sites just minutes before the B-52s came through, reducing much of the enemy defensive capability.

Jan. 8, 1973, an F-4 Phantom of Crafty Flight from Udorn RTAFB, Thailand, was on a night MiG-defense mission, about 70 miles southwest of Hanoi. Red Crown, an EC-121 airborne command post over Laos, warned of a MiG airborne from Phuc Yen airfield heading for the strike force. Following Red Crown's directions, Crafty Flight closed to within 16 miles of the MiG.

Crafty Lead saw an afterburner flame at about 10 miles, then closed to six miles and got radar lock-on. At four miles, a missile was fired which exploded 50 feet behind the MiG. Crafty Lead pulled to within two miles and fired again. This time, the missile tracked cleanly and struck the MiG in the middle. Three flaming pieces of MiG fell from the night sky.

Capt. Paul D. Howman and his backseater, lst Lt. Lawrence W. Kullman, had just made the last MiG kill of the war. The final tally in the air-to-air arena: MiGs downed, 193. American aircraft downed by MiGs, 92.

The battle for the skies of North Vietnam was over.

War expands military aviation

The air war in Vietnam, which ended in January 1973, brought about numerous technological advances in American military aviation.

That war spurred changes in tactics and weapons development of sheer operational necessity. It also caused the Air Force to hang onto aircraft it probably would have retired or given to reserve or guard forces.

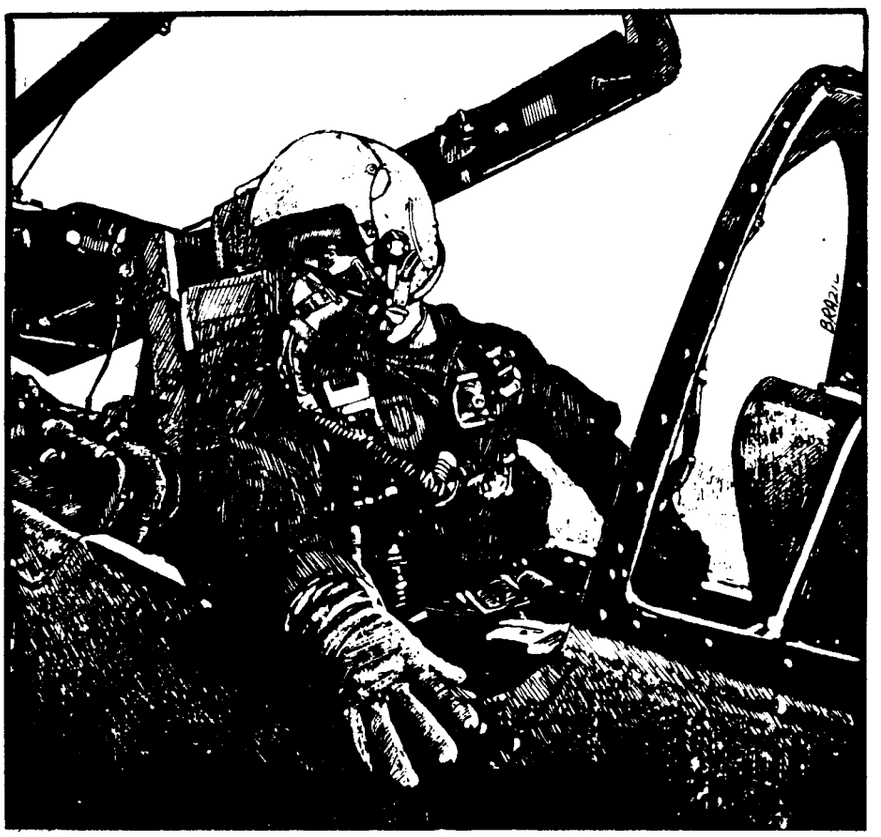
A classic example is the F-100 Super Sabre. The F-100 was the first U. S. Air Force fighter that was supersonic in level flight. It first flew in 1953, during the closing stages of the Korean War.

The F-100 was an air superiority fighter originally designed to replace the F-86 Sabre.

Born too late for the Korean War, the F-100 was nevertheless the premier fighter of the Air Force for several years. It was also used by the Danish, French, Turkish and Nationalist Chinese air forces.

The F-100D, which first flew in 1956, was a fighter-bomber with limited night and bad-weather capability. Beefed-up for its ground attack role, the F-100D carried more than 7,000 pounds of bombs, fuel tanks and rockets on its wing and centerline stations, and had four 20mm cannon in its nose.

These attributes, and the fact that there were so many F-100Ds in the tactical inventory, made the F-100 one of the first jets introduced into Vietnam. The F-100D soon became the workhorse of the war in Southeast Asia.



An A-10 pilot

In fact, it became too much of a workhorse. The Air Force, faced with the necessity of keeping the F-100D in the inventory much longer than it had anticipated, had to modify the aircraft's structure to extend the plane's service life from 3,000 to 7,000 hours. Extensive combat use forced further structural work and re-skinning of portions of the plane.

The F-100D's avionics were improved, and new guns were installed. Engine modifications became an almost-constant workload for frazzled crew chiefs and engine mechanics.

The Air National Guard was given several F-100D's as the 1970s began. By mid-1970, they had 20, while more than 300 were still involved in the Vietnam War. This soon changed, however.

America began pulling its F-100 force out in 1971, under the Vietnamization program, which placed the burden of fighting the war on the Republic of Vietnam and its air force. The Vietnamese were equipped with A-37 Dragonflies—upgraded versions of the T-37 Tweet primary jet trainer—and F-5 Freedom Fighters, kissing cousins of the T-38 Talon supersonic trainer.

By mid-1972, only 12 F-100Ds were on the active Air Force inventory, while the Air National Guard found itself with 335— many direct from combat.

Mid-1972 marked another milestone, however. Even as the first supersonic jet fighters were streaming out of the active inventory, a sky-blue aircraft was rolled out at the McDonnell Douglas Company's plant at St. Louis, Mo. It bore the military designation F-15. Its nickname was "Eagle."

The F-15 Eagle was designed for the air superiority role. With a top speed of more than twice the speed of sound, it is powered with two 23,000-pound thrust, afterburning turbofan engines. The engines give a thrust-to-weight ratio so high, the F-15 is able to accelerate in a vertical climb like a rocket.

At the same time, the F-15 was also designed to slow suddenly and turn with incredible agility, making it capable of dogfighting with anything the enemy could field. It

carries Sparrow radar-guided missiles for long-range use; Sidewinder infrared-guided heat-seeking missiles for medium-range use; and a 20mm electric Gatling-type cannon for close-range use.

The F-15 can be summed up in one word - fighter.

The Navy found itself in a similar situation. The F-8 Crusader was the Navy's first supersonic fighter, and bore the brunt of the air superiority and fleet defense roles for many years.

F-8s figured heavily in the air war over North Vietnam, launching from carriers on Yankee station just outside North Vietnamese waters. F-8s brought down many of the MiGs destroyed by the Navy during the campaigns against the North.

Yet, by the mid-1970s, the Military Aircraft Storage and Disposition Center in the Arizona desert – the "boneyard" – was filled with F-8s. Around the Navy, a new word was being heard: Tomcat.

The Grumman F-14 Tomcat is a swing-winged Navy air superiority fighter .

The F-14 was designed to streak to the aid of the fleet threatened by enemy aircraft, locate the enemy on its computer-assisted radar, which was designed to keep tabs on 14 different targets at once, and engage at least eight aircraft with its "fire-and-forget" Phoenix air-to-air missiles. It is theoretically possible for an F-14 aircrew to down eight aircraft on a single mission without ever seeing their targets, except on the radar screen.

Advanced technology benefitted the air-to-ground role, as well. The Air Force's A-7D was adopted from the Navy, when their A-7A Corsair II attack fighter showed itself exceptional in the attack role.

However, the A-7D, even with its sophisticated computer, had disadvantages in a European combat environment, especially in the heavy overcast and fogs which dominate northern Europe much of the year.

Consequently, the Air Force took a step back from technological sophistication in the latter half of the 1970s. It introduced the A-10

the F-15 can be summed up in one word: fighter

Thunderbolt II close air support aircraft, an unsophisticated, big, maneuverable "pilot's aircraft" designed to work right on the deck.

Heavily-armored, designed to take battle damage and return, the A-10 was built to fly under the weather, maneuver at treetop levels, drop incredible amounts of ordnance and kill tanks with an immense 30mm Gatling-type cannon which takes up most of the nose of the aircraft.

The final fighter introduced in the 1970s was designed to bridge the gap between the F-15s and the A-10s. The F-16 Fighting Falcon, a lightweight, exceptionally-maneuverable fighter, was built to be the "swing-force" aircraft.

When the air superiority role is called for, the F-16 is designed to supplement the F-15s in the air combat arena. When the ground attack role comes to the fore, the F-16s are built to trade missiles for bombs and get "down and dirty" along with the A-10s in attacking enemy ground forces.

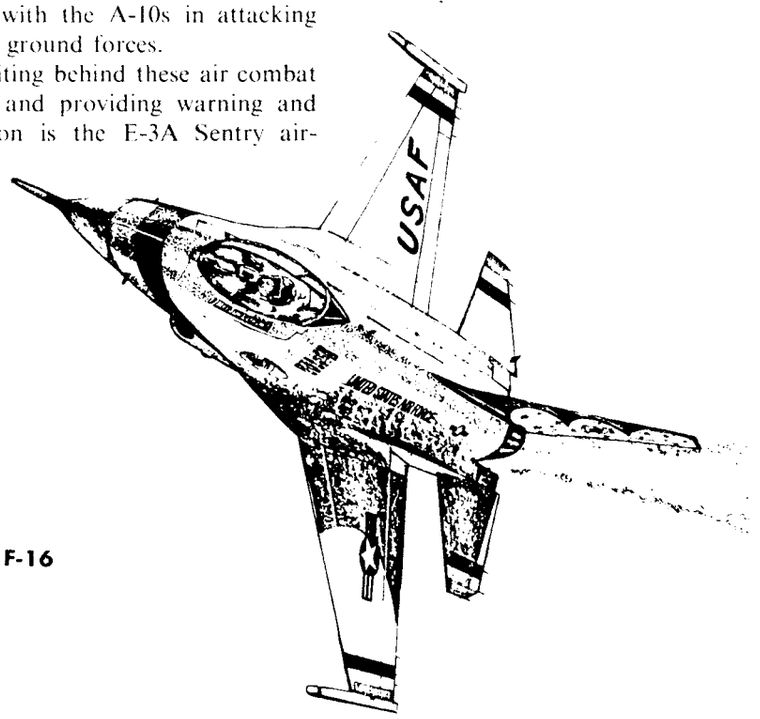
Orbiting behind these air combat forces and providing warning and direction is the E-3A Sentry airborne warning and control system aircraft. These AWACS, Boeing 707s with huge radomes rotating above the fuselage, provide an airborne electronic view of the aerial battlefield. Introduced during the decade, AWACS aircraft provide the United States and NATO with extensive airborne radar coverage.

Two other major aircraft entered the Air Force inventory at the tail end of the 1970s. The E-4A is a Boeing 747 converted for airborne command post duties as the National Emergency Advanced Airborne Command Post aircraft. The abbreviation for the aircraft's role—NEAACP - is pronounced "knee-cap."

The KC-10A Extender, a wide-bodied DC-10 airliner fitted with a refueling boom, was designed as a supplement to the KC-135 Stratotanker.

The Air Force finished the 1970s with fewer aircraft and people than at the beginning of the decade. Yet, by 1979 it had become leaner and more capable.

Many aircraft went to the "boneyard." Their replacements, however, forged a more capable aerial sword to keep the United States from the boneyards of history.



F-16

A look at our future

If the aircraft and air weapons being developed today prove out, the battlefield of 1994 and beyond will be even more deadly than they are today.

Current, unclassified information on research and development both in the West and in the Soviet bloc indicates quantum leaps forward in warmaking technology are just around the corner. Many systems are just short of becoming operational.

What about...

In fact, the increasing potency of airpower will force the potential belligerent of the future to think twice before starting a war, conventional or otherwise. Despite rapid increases in defensive technology, any conflict will be destructive to both sides in short order.

Interestingly, a future conflict would depend on aircraft and weapons familiar to us today. However, many will be modified extensively to meet new roles and new missions.

For example, consider the F-4 Phantom II. This two-engined, two-seater aircraft is still a front-line fighter in many active-duty units, even though it is slowly being phased into the air reserve forces as more modern fighters take its place.

What changes would we find the 1994 Phantom carrying, based on modifications planned and suggested?

For one thing, we would find two new engines. The J-79 engines of the F-4 are very powerful—and very smokey. In fact, the F-4's characteristic smoke trails give opposing fighters a chance to see it coming before it sees them.

Two new, high-thrust, smokeless engines are planned for the Phantom in the next several years. These will not only eliminate the trademark smoke trails, but give the F-4 increased capabilities in the air, in terms of both speed and altitude.

Even the most nearsighted observer wouldn't fail to notice a pair of stubby wings added to the F-4, one atop each engine intake. These canards, a proposed addition based on a test made in the 1970s, would allow the F-4 to make sharper turns than its current configuration.

Another change quite readily apparent would be the direction the two crewmembers faced. The pilot would face forward as he does now. The weapons systems operator in the back seat, however, would face the rear of the aircraft—just the opposite of the current practice.

The F-4 is one of the aircraft proposed for modification to the "Janus" configuration. Named for the two-faced Roman god of doorways and gateways, the configuration puts the back-seater in a position where he can scan the skies to the rear of the aircraft.

This would reduce the F-4's vulnerability in the air-to-air combat arena, but would also remove the control stick from the rear cockpit of the Air Force's Phantoms, as is done in the Navy and Marine versions.

Deadly weapons

The Janus configuration proposal is the source of much contention. Air Force back-seaters receive rudimentary flight instruction, and could now bring a Phantom back if the pilot is killed or hurt. Navy and Marine backseaters, however, have no controls in their cockpit. Their only option is to eject.

If the trade-off can be negotiated -that the added rear-area coverage would reduce the likelihood of damage to the aircraft or crew—the Janus configuration is a distinct possibility in our 1994 version of the Phantom.

Tomorrow's military man?

Our future Phantom would also display a much-improved electronics suite, including new radar displays, new navigational aids, a new IFF (Identification — Friend or Foe) system, more secure and less-jammable communications links, and a wide variety of other upgrades.

Another change would appear beneath the wings. One characteristic of current fighters is the large, cylindrical fuel tanks they carry dangling beneath wings and on system, more secure and less

The 1994 Phantom would carry its external fuel supplies in aerodynamically-designed tanks designed to hook onto pylons and fit tightly against the skin of the aircraft. This conformal tank configuration is currently being used on the F-15 Eagle, and is expected to be used on other aircraft in the near future.

. . . the F-4 launches a brilliantly burning flare, surrounded by an expanded cloud of aluminum chaff.

The F-4 pilot will have improved forward visibility, as well. A single-piece forward windscreen is being developed by McDonnell Douglas for the F-4. The center part of the current F-4 windscreen is a tempered flat glass panel capable of withstanding birdstrikes up to 400 knots, but the side panels provide protection up to only 200 knots.

The new one-piece windscreen will provide protection up to 500 knots. Since it forces relocation of a standby compass, refueling lights, an electronics countermeasures scope and wire bundles, as well as doing away with the titanium bows that hold the glass panel, the pilot's forward visibility will be increased by up to 40 percent.

In 1994...

Along with all the other changes, some of the biggest changes for our 1994 Phantom will be in the munitions it carries. The munitions of 1994 will be considerably upgraded from the bombs and missiles our F-4 carries today.

For example, since the radar environment will be more sophisticated, our F-4 pilot will trade off a quarter of the plane's air-to-air missile capability for an electronic countermeasures jamming pod. This would be carried where he would normally carry a Sparrow radar-guided missile.

He'll give up another quarter of that capability for the ability to strike back at enemy radar sites. Fitted into another Sparrow niche, he'll carry a high-speed anti-radation missile.

When an active radar site locks onto his plane, the F-4 pilot can turn and fire his HARM missile. The HARM will lock onto the radar beam and its computer will memorize the location of the beam's source. Then, even if the radar switches off, the missile will track to the computer's stored location and explode, taking out the radar site.

If the 1994 Phantom is out to destroy enemy airfields, it may carry the French-built Durandal runway cratering bomb or a follow-on design. After the bomb is released, a drogue parachute opens and the bomb swings itself to just above the runway. A rocket motor then cuts in and blasts the bomb down through the runway's surface, where it explodes.

Another F-4 flying alongside, meanwhile, drops area denial munitions pods. The pods break open, sowing the runway area with hundreds of small mines. Self-righting mechanisms flip each mine upright after landing.

Some mines go off immediately, creating additional damage. The rest dot the area. If disturbed, they explode and scatter tiny metal balls to kill runway repair crews or form self-forging slugs to penetrate the bottom of vehicles.

Against armored formations, our 1994 Phantom will be equally deadly. Under its belly, it may carry a three-barrelled 30mm Gatling cannon, a lightweight version of the cannon used in the A-10 Thunderbolt II.

Our 1994 Phantom may find itself in an air-to-air combat situation. Warned by an E-3A Sentry airborne warning and control system aircraft flying many miles behind American lines, the F-4 maneuvers to get the drop on intruders.

Before the F-4 pilot can see the enemy, they show up on the backseater's radar screens. He gives the pilot directions, then the pilot gets a growl in his headphones, telling him one of his Sparrows has picked up the enemy. He triggers it off.

The Sparrow shoots forward, then suddenly curves right. The increased sweep angle of the tiny radar in its nose allows it to be fired at broader angles than previous models.

On his radar, the pilot sees the enemy pilot turn sharply as he perceives the missile threat, but it's useless. The increased agility of the improved Sparrow, provided by tiny reaction motors behind the nose section, plus a better radar, will make it much more difficult to escape.

Suddenly, the tail warning radar of the Phantom signals that it's being attacked by a missile from the rear. The backseater hits a switch.

From a tube at the base of its tailfin, the F-4 launches a brilliantly-burning flare, surrounded by an expanding cloud of aluminum chaff. The F-4 breaks hard left. The enemy missile is decoyed.

If these modifications and retrofits are going to be available for the 1960s-era F-4 Phantom, by then an almost 30-year-old airframe, what will the increased capabilities be of the newer aircraft, including those being introduced right now and those being introduced in the next decade?

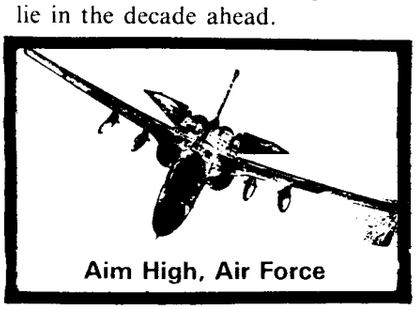
What about the F-15 Eagle in its air defense interceptor, air superiority fighter and air-to-surface strike variations? What about the F-16 Fighting Falcon in its air-combat and strike versions, and versions stemming from the cranked-arrow wing F-16XL?

Futuristic F-4

What about the X-29 forward-swept-wing experimental aircraft? Will it change aircraft design? What about the B-1B bomber, the swing-wing cruise missile carrier? Will it become as versatile as the B-52?

What about the A-10 Thunderbolt II? Will the new inertial navigation system and low-altitude, night-targeting infrared systems create an all-weather tank-killer? Will new long-range weapons double the effectiveness of the F-111 in its interdiction role?

The answers to all these questions lie in the decade ahead.



Aim High, Air Force

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