

In the beginning, the mechanics knew as little about fixing airplanes as the pilots did about flying them. Nevertheless, those eight “aviation mechanics” of 1909 went at the task with an attitude that still persists eighty years later.

The Knuckle-Busters

BY BRUCE D. CALLANDER

SOON after the Air Force broke from the Army in 1947 and went into business for itself, the Pentagon came out with a set of specialty knowledge tests (SKTs) for technical as well as clerical skills.

Some senior aircraft mechanics snickered. Written exams might be all right for clerks, they said, but a good mechanic could tell you what ailed an engine just by listening to it, and then could fix it with his pen knife, if he had to. You couldn't measure that kind of knowledge with pencil-and-paper tests.

The Air Force lost some grizzled old “knuckle-busters” in the process, but the SKTs became a permanent institution. It was time. Engines and aircraft systems were getting too complicated to trust to instinct. The old-timers indeed might have been able to diagnose an engine by its sound, but future ground crews would shut out the roar with earplugs and study the blips on monitors.

The old breed of wrench-benders may have gone the way of wire wheels and wooden props, but even in an era of computerized systems and exotic building materials, their legacy remains.

In the beginning, of course, all aircraft mechanics were civilians. The first worthy of the name probably were the Wright brothers. They made their own airframes and engines and fussed over both like mother hens. When they brought their machine to Washington to show it to the Army in 1908, a young lieutenant named Benjamin Foulois told them he had read a lot about flying. Wilbur Wright told him to forget the books and get acquainted with the machine itself. Foulois put on his coveralls, grabbed some tools, and followed Wright's advice. Remembered as a pilot and later as Chief of the Air Corps, Foulois probably was also the Air Force's first airplane mechanic.

By 1909, the Army had bought one flying machine, and the Wrights had taught three officers to fly it. Foulois was the only one still on aviation duty and the least trained of the trio, but after less than an hour's instruction, he was sent to Fort Sam Houston in Texas with orders to take plenty of spare parts and to teach himself to fly. He was given a voucher for \$150 (to maintain the machine for a year) and eight enlisted men to help.

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At right: KC-135 crew chief at work at K. I. Sawyer AFB, Mich.*



—Staff photo by Guy Aceto

Four of the soldiers had some experience with aviation. They had served briefly on the ground crew of the Army's first dirigible. The four—Sgts. Herbert Marcus and Steven Idzorek and Cpls. Vernon Burge and Glen Modale—would later be among the first men officially rated as "aviation mechanics." At Fort Sam, however, they learned their skills largely on the job under Foulois and Oliver G. Simmons, the Army's first civilian airplane mechanic.

Help from the Blacksmith

With the help of the post blacksmith, tailor, and plumber, the embryonic air force kept its machine flying and even made some improvements. Simmons and Modale got rid of the Wrights's cumbersome catapult and monorail launching system by adapting the wheels of a cultivator into a tricycle landing gear. The post saddlery shop fitted the machine with a seat belt so Foulois wouldn't be thrown out on rough landings.

As best it could, the crew modernized the plane by incorporating changes that the Wrights were making in their newer models. When his \$150 maintenance allowance ran out, Foulois dug into his own pocket to pay for repairs. Even so, by 1911, the plane was in bad shape. While Congress debated the possibility of replacing it, publisher Robert J. Collier bought a new Wright Type B and lent it to the Army.

When the new machine arrived, so did one of the Wrights' own pilots, Phillip O. Parmalee. It was to become common practice for both the Wrights and pioneer aircraft designer and builder Glenn Curtiss to provide a "company man" with each new machine, to teach the pilots how to fly it and help the ground crews maintain it. In effect, these were the first manufacturers' representatives.

By now, eighteen young officers had volunteered for flight training, and the Army decided it was time to set up a permanent school. All flying was halted at Fort Sam, and, in the summer of 1911, planes, pilots, students, and enlisted mechanics were sent to College Park, Md. Oliver Simmons had resigned in order to work for Robert Collier, and the Army hired Henry S. Mo-

lineau to replace him. Molineau would be the only civilian mechanic at the school for the next two years. By June 1911, however, he had fifteen enlisted men to help him, and by that November the number had risen to thirty-nine.

That same year, the Army adopted the pilot test used by the civilian Aero Club of America. The main requirement was completion of three closed-circuit flights of five kilometers each. There still was no specific test for mechanics, and their training was still obtained largely on the job.

instructors taught not only flying but also repair of planes and engines.

Still, the death toll among pilots mounted. Of the forty-eight officers detailed to aviation since 1908, eleven had died in crashes by the end of 1913. Outdated planes, inadequate maintenance, and pilot inexperience were blamed. The following year, Grover Loening, who had been engineer and general manager for the Wrights, was made aeronautical engineer of the Signal Service and sent to San Diego to overhaul the Army's aging planes.



The earliest mechanics were jacks-of-all-trades. World War II greatly increased the demand for skilled craftsmen. Here, a P-51 is tuned up.

The Toll Mounts

When the weather turned bad at College Park, the Army opened a winter school at Augusta, Ga., and included ground school classes for pilots in telegraphy, gasoline engines, and airplane structures. Even this much formal training might not have been scheduled if the weather had not turned sour in Augusta too. In any case, the training took place in the classroom and did not include the hands-on experience pilots really needed. Their scant knowledge of airframes and engines cost the Army both men and machines.

But change was coming. By 1912, the Army opened another flying school in San Diego, where civilian

While Loening's extensive modifications made the planes more airworthy, his department did little actual repair work. To fill the gap, Cpl. A. D. Smith and other enlisted men set up a repair shop and began to overhaul fuselages and wing sections that had previously been sent back to the factory for repair. As the shop grew, it developed separate departments. Mechanics who had been jacks-of-all-trades began to specialize. Corporal Smith and Pvt. Gordon Smith repaired fabrics and fuselages. A private named Kuhn was in charge of woodwork, and a civilian named Semenouk made metal fittings. Maintenance training expanded, too.

In January 1914, the Army adopted tough new criteria for aviator ratings, including a test on engine operation and repair. The requirement applied not to mechanics but to pilots. Foulois, sent to San Diego as a troubleshooter, put the student officers in coveralls and, just as the Wrights had told him, told the students to go into the shops and learn something about their planes. That June, Secretary of War Lindley M. Garrison recommended that aviation officers be sent to airplane factories and that none be licensed until they had mastered the principles of construction.

By then, too, the Army finally had seen the need to develop a corps of skilled mechanics. Earlier, most enlisted men detailed to aviation had been raw recruits who spent as much time putting up new buildings as doing technical work. In the autumn of 1914, the San Diego school asked that only line Army men with an aptitude for mechanics be sent there. The Army transferred forty-four such men. That December, it adopted the examination for the rating of aviation mechanic. Among the first to pass were Marcus, Idzorek, Modale, and Burge—four of Foulois's original crew of eight. By then, Burge was a pilot and Marcus was in flight training. Both would be commissioned in World War I.

A few months before the US entered the war, the Army had sketched plans to build up to thirteen squadrons of twelve planes each by the end of the year. Since planes were expected to wear out in three months of wartime conditions, each squadron would use up forty-eight per year. The life of an engine was figured at about 300 hours, and several engines, costing about \$50 per horsepower, would be needed for each plane. By that pre-war estimate, five trained men would be needed for each machine.

The Plan Meets Reality

In fact, the United States faced World War I with less of everything. The Army had acquired 224 planes since 1909, but few were still in commission. All those remaining were trainers, and most of them were obsolete. It had 131 aviation officers, including recalled reservists and retirees. Of these, fifty-six were pilots and fifty-one were stu-

dent pilots. There were just over 1,000 enlisted men.

When the US finally declared war, there was no lack of eager volunteers for the glamorous new field of aviation, but trained resources were in short supply. Both pilots and mechanics were sent overseas with minimal training to learn on the job from the French and British. Shortages of parts and tools were epidemic. Mechanics turned bronze shafting into bearings and used wood from packing crates to patch fuselages.

An added problem was the fact that French planes and motors were not standardized, so parts from one often did not fit another. Spruce, the preferred wood for fuselages, became scarce, and fir was substituted. Doped cotton replaced linen for wing and fuselage covering.

The US had no combat aircraft of its own design, but it produced parts for foreign planes and shipped them to Europe for assembly. Since few male mechanics could be spared from the combat units, more than 400 women were recruited to work in the assembly plants.

By war's end, the Army had built a sizable force, but it demobilized quickly when the Armistice was signed. The Air Service launched a running public-relations effort to educate the public to the potential of airpower. Lts. John Macready and Oakley Kelly flew coast-to-coast nonstop in May 1923 in an Army T-2 transport. The following year, four Douglas World Cruisers started out to circle the earth; two made it. Army pilots such as Lt. James Doolittle snatched speed records from foreign flyers. In 1929, Maj. Carl Spaatz and a crew of four kept the *Question Mark* aloft over Los Angeles for almost a week with aerial refueling. In a less subtle demonstration of aviation's possibilities, Brig. Gen. William Mitchell showed the Navy what bombers could do to a collection of captured German vessels and obsolete US battleships.

The heroes of this "Golden Age of Aviation" were the pilots. But behind the flyers were ground crews of overworked, underpaid enlisted men who kept the planes flying as they had done through the first years of flying. When the Army was drafted to fly the mail, ground

crewmembers shared the pilots' hardships, often sleeping in hangars and repairing the planes in cold, stormy weather with inadequate tools.

When the Air Corps was established in 1926, enlisted strength was authorized to increase from 8,342 to 14,582, but funds were so limited that the buildup had to be spread over five years. The country entered World War II with shortages of everything, including skilled mechanics.

Mechanics in the Big War

When the newly created Army Air Forces finally began to expand in 1941, growth was phenomenal. Strength increased from barely 150,000 to more than 2,000,000 within two years. Flight schools sprouted all over the country, and technical training expanded to match. By now, the Army was training mechanics not only for ground crews but also as members of flight crews on its larger bombers. The B-24 had a flight engineer to troubleshoot fuel, electrical, and hydraulic systems. He was the ranking enlisted man on the crew and, in addition to being a mechanic, served as a turret gunner.

The flight engineer's position gained importance late in the war, when the B-29 went into action in the Pacific. From a separate crew position, the engineer monitored the plane's systems and even controlled engine settings for the pilot. This trend reached its peak in the postwar B-36. Its crew of fifteen included flight engineers who ran the equivalent of a ship's engine room. Some futurists speculated that the next generation of bombers would be the aerial equivalents of naval vessels. They pictured aircraft commanders as simply giving orders from the "bridge" while specialists did the steering, manned the guns, operated the engines, and maintained the systems.

As it turned out, the B-36 was to be the last of the big-crew bombers. The sleek new jets had no cavernous hulls through which a mechanic could roam with wrench and screwdriver to fix an ailing component. Nor was there the need. Technology had produced black boxes that could monitor the systems, detect trouble, and even correct minor malfunctions. Such electronic trou-

bleshooters weighed less than human mechanics.

Flight engineers still serve on some transports, but technological advances are breathing down their necks as well. In the C-17, the flight engineer will be eliminated on most flights. Even on older transports, electronic devices now monitor sub-systems, diagnose malfunctions, and even advise the pilots on the best power settings.

Ever-Increasing Specialization

If the days of the flying mechanic seem numbered, however, the era of

amazed to find whole armies of airmen specializing in such fields as life-support systems, metals processing, electrical systems, pneumdraulics, egress, and fuels. They would be even more baffled to find airmen whose sole job is to maintain the ground support equipment used to test the systems that keep the planes flying.

The proliferation of specialties has changed even the structure of the maintenance operation. Through World War II, each plane usually had its own ground crew chief and a handful of mechanics.

been done on the line. Maintenance specialties were divided and subdivided into increasingly narrower skills.

Recently there has been an effort to reverse this trend, to combine similar specialties and bring maintenance closer to unit level, particularly in such highly mobile commands as TAC. Such moves would not only provide more versatile maintenance personnel, some officials argue, but would help recapture the unit spirit that existed when air and ground crews had a common interest in individual aircraft.

It's unlikely that the Air Force will ever recapture the mood of a World War II flight line, much less the kind of learning experience Foulois and his eight troops received at San Antonio. Still, the challenge of fixing the machines and keeping them going remains much the same. The spirit of today's jet mechanic echoes that of his professional forebears in more ways than one might expect.

The similarity came through in a recent interview with SSgt. John M. Davis at Chanute AFB, Ill. Now a jet engine maintenance instructor at Chanute's technical training center, Davis spent seven years on the line at Edwards AFB, Calif., and later at Tyndall AFB, Fla. He was asked what was the worst aircraft he ever worked on.

"I guess it was the F-4," he said. "When I first started working on it, I hated it. Then I made up my mind that this thing was trying to kick my butt, and I was going to win. Then it was a challenge. I ended up actually enjoying working on F-4s. Every time I got a new job, it was 'All right. I haven't done this. It's time to try it and see who's going to win here.' I was going to win."

In different words and in a far different time, one of Foulois's eight soldiers might have said much the same thing about the cantankerous Wright machine that struggled skyward from the parade ground at Fort Sam. ■



Staff photo by Guy Aceto

USAF may never again recapture the mood of the World War II flight line, but the spirit of today's jet mechanic echoes that of his professional forebears.

ground maintenance is healthy and growing. Its history is one of ever-increasing specialization. It began in those days before World War I when the largely self-taught enlisted men began to concentrate on specific types of work: some on fixing engines, some on repairing airframes, some on mending fabrics. By World War II, the specialists included armorers, metalworkers, instrument repairmen, and the forerunners of today's avionics technicians.

Today, the charts of airman specialty codes are as cluttered as a plane's circuit boards. Ben Foulois's crewmen would recognize the engine mechanic and the airframe repair specialist, but they would be

Armorers, instrument repairmen, and a few other specialists were consolidated at squadron or group levels. In the postwar demobilization, this approach no longer seemed cost-effective. Much maintenance was consolidated at base levels, and neither flight crews nor ground crews "owned" individual aircraft. Sprawling shops and depots did much of the work that had

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