

## Where Have All the Phantoms Gone?

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How a fighter-bomber-recon-attack superstar ended up as fodder for target practice



**F-4s at Arizona's Davis-Monthan Air Force Base, the warplane retirement home. (Mark Bennett)**

The F-4 Phantom II lives. But the life it leads today is an odd one.

It still flies in other countries; in northern Iraq, for example, the Turks use it in combat with the Kurds. But in the United States, it leads a twilight existence. It's a warplane, but it no longer fights. Its mission is weapons testing, but no pilot flies it. Mostly, you'll find these F-4s either sitting in the desert or lying at the bottom of the sea.

The F-4 entered service in 1960, flying for the U.S. Navy. After studying its potential for close air support, interdiction, and counter-air operations, the Air Force added the F-4 to its fleet in 1963. Eventually the Phantom ended up even in the U.S. Marine Corps' inventory. In four decades of active service to the United States, the aircraft set 16 world performance records. It downed more adversaries (280 claimed victories) than any other U.S. fighter in the Vietnam War. Two decades later, it flew combat missions in Desert Storm.

In 1996 the aircraft was retired from the U.S. fleet. But the venerable McDonnell design has one last mission to perform for the military: to go down in flames.

Since 1991, 254 Phantoms have served as unpowered flying targets for missile and gun tests conducted near Tyndall Air Force Base in Florida and Holloman Air Force Base in New Mexico. The use of F-4 drones (designated QF-4s) is expected to continue until 2014.

When an airframe is needed for target duty, one is pulled from storage at Davis-Monthan Air Force Base in the Arizona desert. The airframe is given refurbished engines and instruments, then sent to Mojave Airport in California. There, BAE Systems turns the aircraft into remote-controlled drones, installing radio antennas and modifying the flight controls, throttles, landing gear, and flaps.

QF-4 production test pilot Bob Kay is responsible for testing the converted aircraft, then flying them from Mojave to Tyndall and Holloman. Kay has been captivated by the F-4 since the age of seven, when his father took him to an airshow. "I saw a Navy A-3 refueling two Phantoms as they flew over so low and with that noise," he says. "That's all I remember of that airshow, but I knew I wanted to fly that fighter."

I ask if he has any second thoughts about being part of a system that destroys an airplane he loves, an aviation legend.

He thinks for a moment, then says, "What better way is there for a warrior to end its life than to go down in a blaze of glory?"

The Phantom has been called "double ugly," "rhino," "old smokey," and monikers even less flattering. The design does have its share of ungainly bends and angles. The horizontal stabilizers droop 23.25 degrees. The outer wing sections tilt upward 12 degrees. When an engineer looks it over, the first thing that probably comes to mind is "stability and control problems." A brutal example of that weakness occurred during a May 18, 1961 speed record attempt. While Navy test pilot Commander J.L. Felsman flew below 125 feet over a three-mile course, his F-4 experienced pitch damper failure. The resulting pilot-induced oscillation generated over 12 Gs. Both engines were ripped from the airframe and Felsman was killed. (A later attempt succeeded.)

Control sensitivity varies widely. It takes full aft stick to raise the nose for takeoff, yet at certain fuel loadings and at speeds just above Mach 0.9 at low altitude, moving the stick only one inch can produce 6 Gs on the airframe. At above Mach 2, on the other hand, the shock wave that is created moves the center of lift so far aft that pulling the stick all the way back produces only about 2 Gs.

With all its peculiarities and faults, legions have had love/hate relationships with the aircraft. "The F-4 is the last of the fighter pilot's fighters," says BAE's Bob Kay. "You have to fly the F-4." It has none of the bells and whistles of next-generation fighters. Instead of the multi-function flight displays found in modern fighters, the cockpit instruments are "steam gauges"—round dials with needles. It has an inertial navigation system, best described as cranky. There is no flight management system, no GPS, no Electronic Flight Instrument System (EFIS), and no "Bitching Betty" voice system to alert the pilot to hazards. You have to navigate, bomb, shoot missiles, fire the gun, look for problems, and evaluate every one of those actions instrument by instrument. For the pilot, this means a lot of time is spent head down, analyzing instrument data; in modern aircraft, on the other hand, much of the information is presented compactly, in head-up displays above the instrument panel.

My affair with the Phantom began upon graduation from pilot training in 1964, when I landed a tour in the Air Force F-4C. Though the Navy and Marine Corps assigned radar operators to the "pit," as we referred to the second seat, the Air Force thought it would be more effective to use the configuration for two pilots. Wrong. No true fighter pilot chooses to serve as copilot. The assignment was akin to a shotgun marriage. For two years I languished six feet behind my more experienced comrades, calling off altimeter readings as they bombed, strafed, and fired rockets in training exercises on the gunnery range. Backseaters had to beg, cajole, and whine for stick time, and when we got it, we found that every aspect of flying the F-4 from the rear cockpit was a nightmare. The meager instruments were placed haphazardly in a straight line across the panel. The useless clock and G-meter were located in the center. Why? Because they fit there! Instrument approaches gave you a migraine. And to spot the runway, you had to peer through a knothole on either side of the cockpit, which made landing from the pit an adventure, especially with a crosswind.

Front-seaters were not always thrilled with the F-4 either. In 1972, during his second tour in Vietnam, U.S. Air Force Major Dan Cherry, now a retired brigadier general, flew 185 combat missions in the Phantom; today he recalls: "The F-4 cockpit was uncomfortable, the instruments were poorly arranged, crew coordination was a hassle, it was ugly, and it used fuel like nobody's business."

Crews that flew the airplane for the Navy had their own share of problems. By 1966 the Rolling Thunder bombing campaign waged by the Navy and Air Force had really heated up. Large formations of fighter-bombers were striking targets in the Hanoi area daily. That year Commander Dick Adams' squadron flew combat in F-4s off the carrier USS Franklin D. Roosevelt. Each Phantom launched from the Rosie's short catapult with four 500-pound and four 1,000-pound bombs, plus an empty centerline tank, which was refueled during climbout. Before a carrier landing, Phantoms had to achieve a certain landing weight; landing heavy would overstress the arresting cables. For this carrier, the F-4 was a heavy aircraft, and as such could try an approach with fuel for only one or two attempts. On the 1966 cruise, one of the squadron jets on a landing attempt was waved off, and when the pilot ran out of fuel before completing a second pattern, the engines flamed out and the aircraft went deep-six. The crew survived.

In March 1966, I was told that if I agreed to take a combat tour, I'd get the front seat. Are you kidding? I made my first front-seat flight at MacDill Air Force Base in Florida. I still remember it: a gunnery mission. And oh, the visibility from the front chair! My landing was the smoothest of "grease jobs." At that moment, the shotgun marriage turned into a love affair.

After passing my checkout flight, I was stationed at Ubon Air Base in Thailand, a member of the 555th—"Triple Nickle"—Squadron in Colonel Robin Olds' famed Eighth Wing.

At Ubon, the F-4 was all things to all people. One squadron flew only at night, popping flares and dropping bombs. The other two squadrons flew both day and night, dive-bombing bridges, strafing ground targets, rocketing truck parks, and tangling with the ever-elusive MiGs over Hanoi.

On October 11, 1966, I discovered how tough the Phantom was. An 85-mm round blew a four-foot section off my right engine, and the aircraft caught fire. Still, it held together through the 400 miles back to Ubon.

By the end of 1966, the Phantom had revealed a host of shortcomings. Number one was the dismal record of missile hits against the North Vietnamese MiG-17s and MiG-21s. The AIM-7 radar-guided missile had a probability of kill below 10 percent. Richard Keyt, who flew F-4s for the 35th Tactical Fighter Squadron during the Vietnam War, recalls: "Our missiles were designed to work in a non-maneuvering environment—a non-turning, 1-G shot at the bomber target flying straight and level at high altitude." The reality: "F-4s fired in high-G turns at small MiGs that were turning hard and pulling Gs." To remedy the problem, the Air Force expanded its Weapons System Evaluation Program (WSEP) at Clark Air Base in the Philippines. Combat crews were given practice in firing missiles at towed radar-reflective targets.

My backseater, First Lieutenant Jerry K. Sharp, and I took part in that exercise over the South China Sea in December 1966, scoring a hit. On January 2, 1967, we used the skills we had honed in that exercise when we merged with a flight of four MiG-21s that were turning hard to get at us. Sharp got a radar lock-on while under heavy Gs. Then I centered the steering dot, fired two AIM-7s, and watched as the second missile exploded and tore the tail section from the MiG in front of us.

For other F-4 shortcomings, the military contracted out quick fixes. Modifications included the installation of Radar Homing and Warning (RHAW) gear—a cockpit system that alerted pilots when their aircraft was being tracked by anti-aircraft-artillery radars or surface-to-air-missile sites. Also added were radar jamming pods, plus chaff and flare dispensers used in combination to confuse tracking radars and to dupe radar-guided or heat-seeking missiles.

The C variant had a number of design problems; one of the biggest was lack of a gun. The rules of engagement over Vietnam required that an adversary be identified visually before a missile could be fired at it. The MiGs were small, and to make the ID, shooters had to get close, often much less than the minimum distance that the AIM-7 radar-guided and AIM-9B heat-seeking missiles required to hit a target. At short range, "if you didn't have a gun, you couldn't shoot down anything," says Richard Keyt. The quick fix was the SUU-16/A gun pod with the M61A1 20-mm cannon.

But without a lead-computing sight and with no tracer ammunition, F-4C pilots were denied the visual cues needed to correct aiming errors. Then, in 1967, the F-4D arrived. The D model introduced a lead-computing optical sight for use with the gun pod. In addition, the normal ammunition load now included tracers.

On November 6, 1967, the gunfighter Phantom proved its worth. Captain Darrell "D" Simmonds and First Lieutenant George H. McKinney Jr. were escorting a flight of F-105s that came under attack by two MiG-17s. "We picked up the MiG-17s visually that were shooting at the Thuds [F-105s]," says Simmonds. "I was able to get in there and maneuvered for a perfect 'uphill dart' shot. I hit him, came alongside, and looked at him, and he looked at me, then ejected just before the plane hit the trees." McKinney spotted another MiG-17 and Simmonds swung into a hard turn, accelerating as he lined up for the shot. "We were close, but I didn't want to miss the opportunity," the pilot remembers. "I fired and he blew up." Later, Simmonds realized: "We had used just 497 rounds for the two kills—less than five seconds of firing."

The D model, however, was not a cure-all. "The guns on the D hung externally, on the centerline, and that created drag," says Keyt. As for the missiles, the underperforming AIM-9B was abandoned for the Hughes AIM-4D Falcon. Designed to bring down strategic bombers, it required cooling of the seeker head prior to launch and needed a direct hit to score a kill. As pilots found out during what became known as the "Falcon Fiasco," it came up short in a dogfight. Major James R. Chamberlain, a backseater stationed with the "Gunfighters"—the 366th Tactical Fighter Wing at Da Nang—notes, "The biggest problem with the AIM-4D was the limited amount of cooling time available [two minutes or less], which meant that the missile could not be pre-cooled for a quicker lock-on. And, once available liquid nitrogen was consumed, the missile was a blind, dead bullet—derisively called the 'Hughes Arrow.' " After firing four of the missiles in combat without success, Robin Olds insisted the missiles cost him his fifth kill. He ordered them removed from his fleet.

The Air Force soon trashed the AIM-4D. Newer Sidewinders were substituted. The military also recognized the benefits of an internal gun: The F-4E, introduced in 1967, had an M-61A cannon mounted beneath a solid-state AN/APQ-120 radar, both inside the aircraft nose. During the time Richard Keyt's 35th Tactical Fighter Squadron was based at Korat air base in Thailand, five squadron aircrews were credited with MiG kills, and four used the internal gun.

In 1973, during my third tour in Southeast Asia, I was assigned to the early E model. It was a dream to fly, not only because of the improvements made in gun and missile technology but also because the Air Force had realized the folly of putting two pilots in a fighter. After 1967, virtually all the GIBs—guys in back—were either navigators or radar intercept operators.

The follow-on Es brought enhancements: A horizontal tailplane with a fixed inverted slat gave improved control at high angles of attack. Leading-edge slats on the wings enabled tighter turns at slow maneuvering speeds. A Northrop system called TISEO (target identification system, electro-optical) identified airborne targets.

By the time my final tour was up, in 1974, a fleet of Phantom variants had safely taken me through a gauntlet of fire and flying experiences that would constitute the greatest adventures of my life.

Three-plus decades later, I was once again in the company of Phantoms. This time the setting was the tarmac at Tyndall.

The commander of the 82nd Aerial Target and Recovery Squadron, which conducts the drone shootdowns, is Lieutenant Colonel J.D. "Bare" Lee. A former F-16 pilot, Lee also has 1,500 hours in the Phantom. He still recalls the first time he took to the air in one. "I was shocked at how much more difficult it was to fly than I thought it would be," he told me. "When I got home, I told my wife, 'I think I just traded in a Porsche for a '72 Cadillac.' "

At any one time, a total of up to 80 F-4s are stationed at Tyndall and at Lee's Holloman detachment in New Mexico. Twenty-one Phantoms sat on a ramp called the Swamp, awaiting movement to Death Row, the holding area for the soon-to-be targets.

At mid-afternoon the drone mission briefing took place. The meeting included the drone "fliers," Lockheed Martin personnel headed by pilot/controller Matt

LaCourse. "Today's mission is in support of WSEP, so there'll be a lot of shooters out there," said Lee. "WSEP" is the same Weapons System Evaluation Program I had participated in four decades earlier in Vietnam, when I'd practiced shooting at towed targets from F-4s. Now the F-4 was the target.

LaCourse explained that four F-22 Raptors would each fire the latest AIM-120 air-to-air missile. The shooters and chase plane would take off from the main runway, while the drone used a strip three miles east.

Most Phantoms wind up in the Gulf of Mexico within one to three missions. But not all: One, nicknamed "Christine," after the Stephen King book and film about a crazed car with a mind of its own, had survived 10 missions. Another, "Son of Christine," has come back from 12 sorties, the current record.

Some drone missions are not meant to be shootdowns: The Phantom is loaded with missile jammers, and missiles without warheads are fired against the craft to test how well the jamming works. Other Phantoms are spruced up with Vietnam War-era camouflage and flown to airshows.

One Phantom was saved by its former pilot. On April 16, 1972, Dan Cherry, flying an F-4D, had scored a victory over a North Vietnamese Mig-21. Thirty-two years later, during a trip with friends to the National Museum of the Air Force in Dayton, Ohio, Cherry encountered the aircraft he had flown that day. It was on display in the little town of Enon, outside Dayton.

"In spite of her flat tires, weeds growing up all around, bird droppings everywhere, and faded gray paint, she was beautiful," he recalls. "Walking around her and answering my friend's questions made me realize how much I loved her and how much I owed her for taking such good care of me. Suddenly all those things that seemed like negatives before paled in comparison to the strong bond I felt at that moment." Cherry took on the task of relocating the aircraft to the Aviation Heritage Park in Bowling Green, Kentucky, where it was restored and is now displayed. Then he decided to learn about the pilot of the MiG he had shot down.

(Cherry's story about meeting his former enemy in Vietnam will appear in a future issue of Air & Space/Smithsonian.)

At Tyndall, the heat and humidity hit my face like a wet washcloth. The van driver took us from Death Row to the end of the runway, where F-4E tail number 73-1165 was positioned about 20 feet to the right of the runway centerline.

I asked if I could approach the aircraft. My unit escort, Major Kevin Brackin, obtained permission. I got out of the van and walked across the concrete. When I reached the aircraft, I placed my hand on the radome. Because of the cloud cover, the nose was warm to the touch, not the usual egg-frying hot. The Phantom felt alive.

I felt a wave of dread. Within minutes this magnificent machine might be in pieces at the bottom of the Gulf of Mexico.

A photo was taken, and I headed back to the van to listen to the radio chatter.

Lee says it cost the Air Force \$2.6 million to get the aircraft from the boneyard in Tucson to the runway at Tyndall. Is it worth it? "The F-4E has the built-in ability to launch flares and chaff and can carry an assortment of jamming pods, all of which put our latest weapon systems through their most rigorous tests," says Lee. Had we taken the time to test our missiles properly in the early 1960s, the Vietnam air war might have turned out like the one over Baghdad: a clean sweep.

We positioned ourselves behind the drone to await the launch order. Both engines were started. The canopy was closed, and the self-destruct bomb was armed for use in case the drone went out of control. Finally, the intake screens in front of the engine inlets were removed.

Then came an ominous ground transmission: The "shooter aircraft have problems," and a storm cell had slung cloud layers over a wide swath of sky. We sat and waited. Finally, after a 15-minute delay, the mission was ordered back on.

The drone launch order was soon passed, and the operators got the Phantom rolling. LaCourse made a correction to get the aircraft precisely on centerline as both afterburners lit. Fifteen seconds later, I watched the pilotless aircraft take off.

The F-4 proceeded out over the gulf. The first aircraft fired its missile. The ground controller monitoring the telemetry radioed the air crews: "No hit."

The Phantom flew on.

My emotions tangled: I wanted the aircraft to survive, but I also wanted it to fulfill its intended mission.

The four F-22 Raptors spread out. Each launched a missile. Over the radio we heard "Fox-four"—all shooters had fired.

Then: "Splash." A direct hit.

Brackin and I walked back to the van and got in. Brackin was staring straight ahead. Then he turned to me. "So now you know," he said, grinning. "It takes four Raptors to kill an F-4."