



DOD photo

Ascendent Eagle

By Rebecca Grant



The F-15 masterfully addressed USAF's air combat frustrations from Vietnam and became the most successful fighter in history.

The F-15C Eagle has tallied the most lopsided score of any Air Force fighter in history: 38 USAF kills, no losses. Its record fulfilled the Air Force's quest to build the best fighter in the world for air-to-air combat. That pursuit had its origins in the struggles of the 1960s.

The Air Force's official history of the 1991 Gulf War noted that, in Vietnam, the air-to-air exchange ratio between USAF and Navy fighters and their North Vietnamese enemies was "discouraging," rarely topping two-to-one. That experience was a bitter one for airmen accustomed to strong success in the last two years of World War II, where American pilots outscored Japanese and German opponents by 10-to-one, and in Korea, where US fighters led by F-80s and F-86s racked up a similar kill ratio.

The slim margins in Vietnam had many causes. Fractured command, political restrictions, and a lack of realistic training all played a part. So did the wily tactics of the Vietnamese MiG-17, MiG-19, and MiG-21 pilots. On top of this, the AIM-7 and AIM-9 missiles, which equipped most US fighters, suffered from poor reliability.

Yet for the Air Force the overarching lesson was that it did not have a fighter optimized for air-to-air combat, as the trusty F-4 Phantom was a multirole fighter. Against the Soviet Union and Warsaw Pact forces in Europe, that

might not be good enough. Killing Soviet MiGs had to be treated as a top priority.

The answer? The F-15.

The Eagle began life under the name F-X: for fighter, experimental. Studies of an F-X to replace the F-4 began in 1965. Senior leaders on the Air Staff were well aware that the F-100 and F-4 fleets were not a force for air superiority.

Turn and Burn

"If I had been commander of four wings of Russian fighters I could have wiped us out in a single morning of air-to-air combat," said then-Maj. Gen. Arthur C. Agan in a 1973 oral history interview. Agan was serving as assistant deputy chief of staff for plans and operations on the Air Staff in 1965.

But building a true air dominance fighter was not a foregone conclusion. The McNamara Pentagon favored plentiful, cheap, and "joint" aircraft.

Agan convened a panel including aces from Korea and World War II and charged them with finding improved technology for a new fighter. Step 1 was to agree to design the best air-to-air fighter technology could provide. Once that was achieved, USAF could modify it for the fighter-bomber mission.

Step 2 was deciding which technology path to follow. Should the new fighter seek dominance by flying higher and faster, or should it emphasize maneuverability so it could turn and burn? The two paths

came together in a concept called the Blue Bird.

Blue Bird maximized maneuver and added healthy doses of power, altitude, and range. "What the 'turn and burn'" F-X advocates wanted was an aircraft with relatively conventional avionics and weapons—including cannon—but with the engine power and aerodynamics to defeat any Soviet fighter in turning dogfights at low and medium altitudes," wrote Marshall L. Michel III in a 2006 doctoral thesis on USAF after Vietnam.

The embryonic F-15 had powerful support. USAF four-stars from Air Force Systems Command, US Air Forces in Europe, Pacific Air Forces, and Tactical Air Command at Langley AFB, Va., banded together behind the Blue Bird concept. Over the next two years they fended off many challenges. Some wanted USAF to buy the upcoming Navy F-14. The Office of the Secretary of Defense offered another candidate fighter—nicknamed Red Bird—that would be a lightweight, mass-procured solution. However, USAF leaders remained firm.

Part of their motivation was to avoid the complications of the TFX program, which was about to yield the F-111. Although the F-111 would one day prove itself in combat, the program was in the doghouse when early studies for the F-15 began.

Secretary of Defense Robert S. McNamara had insisted USAF and USN develop the fighter jointly. The TFX program

Left: An F-4 (carrying a target mounted under its left wing) and an F-15 fly together over the desert. The F-4 Phantom was an effective multirole fighter, but USAF believed it needed a fighter optimized for air-to-air combat. Enter the F-15. Below: Stills from a History Channel film show an Israeli F-15, one wing sheared off from a collision with an A-4 during training, being maneuvered to land on a runway in Israel.

Photos courtesy of the History Channel





The Soviet-built MiG-25 Foxbat—this one carrying four AA-6 Acrid missiles—was designed to counter supersonic USAF bombers and reconnaissance aircraft. The Eagle proved superior.

featured all the latest technology such as variable-wing geometry, state-of-the-art avionics, terrain following, and precision bombing capabilities, all while being filled with compromises. Consequently, it was expensive and unpopular.

Never really enthused about the F-111, the Navy thoroughly lost interest in the TFX as a carrier-based fighter and dropped out of the program in 1968. The Air Force continued with the program and ultimately procured the aircraft as the F-111 for use by Tactical Air Command and as the FB-111 for Strategic Air Command.

Although General Dynamics manufactured 563 F-111s, the McNamara TFX program was seen as a mistake because it tried to fulfill too many requirements with one system.

With air superiority on the line, the last thing USAF wanted was a repeat of the TFX experience. Two events let USAF avoid that road.

First, a new menace appeared. In July of 1967, the Soviet Union presented the MiG-25 Foxbat to the world. Although the jet had first flown in 1964, little was known about it until four MiG-25s performed a fly-by at the Moscow air show. The Foxbat startled Western observers and indicated the USSR was serious about air superiority. Analysts believed the muscular Foxbat was designed to counter supersonic USAF bombers and reconnaissance aircraft such as the SR-71. If so, it would pose a stiff challenge to the F-4 and to NATO strategy.

For the Air Force, the MiG-25 looked like a fighter with extreme agility and interceptor speed. The speed part was true: The Foxbat had two afterburning turbofan engines giving it a top speed in excess of Mach 2.

The MiG-25 set numerous records and became the first aircraft to reach an altitude of 115,000 feet.

In 1976, a defector would land a brand-new MiG-25 in Japan, and USAF, after disassembling and studying it, discovered the Foxbat's limitations. A true high-speed interceptor, it turned out not to be the air combat powerhouse analysts feared; it could only bear a turn of less than five Gs. But in 1967, the MiG-25 represented a thrown-down gauntlet.

Built-in Dominance

The next critical event was the November 1967 announcement of McNamara's departure. With him went the pressure for the Air Force to take a chance on another joint aircraft program.

The Air Force was then free to respond to the challenge of the Foxbat. In December 1967, General Dynamics and McDonnell Douglas received contracts for a new fighter. Formal proposal contracts on the Blue Bird concept followed a year later. In the final proposal round, Fairchild Republic, North American Rockwell, and McDonnell Douglas submitted designs. No fly-off was held.

In a hurry, USAF in December 1969 selected McDonnell Douglas to build its

premier new fighter. The task: Build "a fighter superior in air combat to any present or projected Soviet fighters," noted Capt. David R. King and Capt. Donald S. Massey in a silver anniversary retrospective on the F-15 published in 1997.

The first F-15 rolled out of the plant in St. Louis just 30 months after McDonnell Douglas' selection. First flight came on July 27, 1972, in California, and USAF accepted its first operational aircraft in January 1976.

Dominance was built into every aspect of the new fighter. The design gave the F-15 a high engine thrust-to-weight ratio paired with low wing loading.

"First and foremost was the Air Force requirement that under certain conditions the F-15 had to have a thrust-to-weight ratio greater than one-to-one, meaning the engines had to develop more pounds of thrust than the airplane weighed so the airplane could accelerate going straight up," recalled Rich Martindell, a retired USAF pilot and safety investigator.

Light wing loading was just as important. The F-15's ratio of aircraft weight to wing area created extreme maneuverability. Together these design features gave the F-15 a superb ability to turn tightly without losing airspeed. Locked in a close fight with other aircraft, the F-15 could turn hard and still maintain speed and energy for its next move. Here was the superior combination USAF was seeking.

Pratt & Whitney developed the F100 engine specifically for the Eagle. Early F100 series engines gave 24,000 pounds of thrust apiece, and later modifications improved reliability and increased thrust to 29,000 pounds.

Advantages did not stop with thrust. The F-15's aerodynamics and flight-control systems were "amazing," explained Martindell. "Looking at an F-4 and an F-15 side by side, even though the F-15 is much larger, it is still sleeker and not as brutish as the F-4."

Added to that was a flight-control system that allowed the pilot to move the stick in the desired direction, leaving the flight computer "to figure out the necessary control deflections for the ailerons, elevons, and rudder, all of which could operate independently as needed, to get the correct response," he said.

This level of control stood in stark contrast to the F-4.

"In the F-4, once you went over 19 units angle of attack you could not move the stick left or right to control roll or the aircraft would depart controlled flight from adverse yaw," noted Martindell.

And one other nice-to-have feature, appreciated by deployed pilots from muggy Guam to the dusty Middle East over the decades: the fantastic air conditioner.

Inside the F-15 was something that made it altogether different from the lightweight, expendable fighter concept: its radar. F-15 radars have been substantially upgraded over the years, culminating in the current active electronically scanned array variants. But the radar made it a standout from the start.

The first F-15s were equipped with the AN/APG-63. It was an X-band pulse Doppler radar tuned to observe targets at all altitudes and ranges—especially the coveted airspace beyond visual range.

The need to accommodate such a large radar in the nose section was one of the reasons the F-15 had to be so much larger than previous fighters, according to Martindell. Hughes, the original radar manufacturer, calculated that the F-15 would need a physically large radar to achieve the power and detection ranges the Air Force demanded.

The F-15 was first employed in combat on June 27, 1979, but not in US hands. Six F-15 pilots of the Israel Defense Forces encountered Syrian MiG-21s over southern Lebanon. The Israelis shot down all five MiG-21s.

The IDF's F-15s racked up many more kills against Syrian MiG-21s, MiG-23s, and MiG-25s through the 1980s. The IDF also claimed a pair of MiG-29s in 2001.

One-Wing Landing

The IDF's defeat of a MiG-25 in February 1981 was especially noteworthy, as this was the once-vaunted Foxbat the F-15 had been designed to counter. In fact, after the 1976 defection unmasked the Foxbat's shortcomings, the Soviet Union decided to cut its losses and quit producing the interceptor. Even so, many MiG-25s were sold to Libya, Syria, India, and others.

One Israeli F-15 added a spectacular footnote to Eagle lore that demonstrated the true rugged maneuverability of the jet.

On May 1, 1983, an F-15D—engaged in dissimilar air combat training over the Negev desert—collided with an Israeli A-4 Skyhawk. The A-4 pilot ejected, but the collision sheared off one wing of the F-15D, which plunged into a spin. Applying afterburner and skillfully manipulating the large remaining surfaces and flight control computers, the pilot recovered the F-15D and actually landed the one-

winged fighter on a runway nearby. The IDF later repaired the aircraft and returned it to flight operations with a new wing.

Meanwhile, USAF was taking delivery of the new F-15C/D variants. The Air Force received the first of 408 F-15Cs and 62 two-seat F-15Ds in June 1979. The F-15C had been upgraded with 2,000 pounds of extra internal fuel among other improvements. Later, USAF also launched a formal multistage improvement program for aircraft already in the inventory, to give them structural, radar, and electronic warfare upgrades. The F-15C/Ds were also wired for the AIM-120 AMRAAM.

For all the wonders of the Eagle, it did not earn a US combat reputation until Iraq invaded Kuwait on Aug. 2, 1990. F-15Cs were among the first USAF forces to touch down in Saudi Arabia to defend the kingdom from further Iraqi aggression. A total of 48 F-15C/Ds from the 1st Tactical Fighter Wing made the nonstop flight from Langley to Dhahran, Saudi Arabia, tanking along the way.

Another group, deployed in September 1990, was the 58th Tactical Fighter Squadron from Eglin AFB, Fla. This was no ordinary unit. The 33rd Tactical Fighter Wing cherry-picked its most experienced pilots from three squadrons to augment the 58th FS "Gorillas." A few months later, they would take the lead in sealing the F-15's air combat reputation.

Operation Desert Storm counted on USAF-led coalition airpower to break up Iraq's air defenses and open the door to several weeks of steady attack on Iraq's ground forces. The job of the F-15Cs was to ensure that Iraq's well-stocked air force could not disrupt the coalition air armada's highly orchestrated attacks.

Iraqi dictator Saddam Hussein was confident his air defenses could hold their own. Intelligence sources said he believed his integrated air defenses would shoot down enough coalition aircraft to force an early start to the ground war. "They will [only] be engaging in Rambo stunts," he taunted before the campaign, according to a 1992 article in the *Journal of Strategic Studies*.

For their part, coalition airmen were much more confident. Still, Air Force Chief of Staff Gen. Merrill A. McPeak warned President George H. W. Bush that the coalition might lose up to 100 aircraft.

The F-15 would be the decisive factor in keeping Iraq's air force at bay. Other fighters shared air superiority tasking, but not in the same measure as the F-15. For example, Navy F-14s were committed to defensive operations around the two carrier task forces. Meanwhile, F-16s mainly suited for multirole operations flew in large strike packages on bombing and air defense suppression missions. Navy and Marine Corps F/A-18s flew counterair but were on tap for bombing missions, too, as

Three pilots of this F-15C, Gulf Spirit, scored four aerial victories in Desert Storm, as noted by the flags and star. No F-15s were lost during the conflict.





An F-22 Raptor (l) and an F-15 fly in formation near the USAF Weapons School, Nellis AFB, Nev. The two fighters are expected to fly for decades to come.

were the attack-specialized A-10s, A-6s, A-7s, and AV-8s.

For months, F-15Cs flew combat air patrols (or CAPs) along the borders of Kuwait and Iraq. On the other side of the line, Iraq listed some 700 aircraft of various types—including Soviet-built fighters—plus about 75 French-made F-1 Mirages. The Iraqi air armada included more than 200 older MiG-21s but also featured Su-25s, MiG-23s, MiG-25s, and nearly 40 new, highly capable MiG-29s.

Before the Border

The night of Jan. 17, 1991, saw the proof of the F-15's dominance. The F-15Cs from the 33rd TFW and 1st TFW shot down Iraqi fighters far behind enemy lines and bagged both an F-1 Mirage and a pair of MiG-29s south of Baghdad. In total, the F-15Cs scored six kills on the first night of Operation Desert Storm.

Two days later, Capt. Cesar A. Rodriguez and Capt. Craig W. Underhill tracked a pair of MiGs until they slipped into the cover of an Iraqi SAM site. Suddenly a second pair of MiG-29s popped up. Rodriguez maneuvered defensively until Underhill shot down the MiG-29. At 8,000 feet, Rodriguez turned his F-15C hard into a circling fight with the second MiG-29.

“By the time it was all over, we were both below 300 feet,” said Rodriguez. When the Iraqi MiG-29 tried a Split-S to get under Rodriguez, the Iraqi misjudged the remaining altitude and hit the ground. The F-15's turn-and-burn qualities had paid off handsomely.

Another round of kills came as Iraqi air force pilots fled to Iran. Capt. Thomas N. Dietz and 1st Lt. Robert W. Hehemann were both members of the 36th Tactical Fighter Wing from Bitburg AB, Germany. On Feb. 6, 1991, they were flying CAP east of Baghdad when an E-3 AWACS aircraft notified them of Iraqi aircraft taking off from a nearby airfield. The Iraqi fighters—on the deck at 100 feet—were trying to flee to Iran, as several dozen had since late January.

“The trick was to get to them before they got to the border,” recalled Dietz. The two F-15s ran north and then banked right to close in behind the Iraqis. Hehemann shot down two Su-25s and Dietz shot down a pair of MiG-21s, all with AIM-9s.

“We were at the right place at the right time,” Dietz said later.

Because of the F-15's abilities, Desert Storm was the first conflict in history where air-to-air kills beyond visual range predominated. “Of the 23 AIM-7M kills credited to USAF F-15s,” noted the *Gulf War Air Power Survey*, “16 involved

missiles that were fired from beyond visual range.”

The F-15's degree of control over the combat airspace had “no historical precedent,” the survey concluded.

With the F-15, the 58th FS, and its augmentees tallied 12 aerial victories—the most of any squadron in Desert Storm or since.

No F-15Cs were lost. The Eagle hatched from project Blue Bird has never experienced a combat loss.

Today, USAF's F-15C/Ds may perch above 50,000 feet awaiting their prey. In exercises such as Cope North and Red Flag, they scream and slice into the air battle using every advantage of speed and turning envisioned by the Air Staff generals of the mid-1960s.

Though eclipsed by the powerful F-22 Raptor in agility, stealth, and computer power, USAF sees its F-15s serving alongside the Raptors for another two decades to come. The F-15 has truly served as the most dominant air superiority fighter in history, and its 30-year reign as king of air combat may never be rivaled. ■

Rebecca Grant is president of IRIS Independent Research. Her most recent article for Air Force Magazine was “Iraqi Freedom and the Air Force” in the March issue.