Counterpunch

Flying Wild Weasel missions involved a variety of airframes but just one philosophy: Do unto SAMS before they do unto you.

An F-100F, the two-seat version of the old frontline fighter, is leading a flight of four F-105D Thunderchiefs streaking behind a ridgeline into North Vietnam on December 22, 1965. The specially equipped F-100 is searching for surface-to-air missile (SAM) sites, to which it will lead the four F-105s. It had been only seven months since U.S. pilots had begun to fall to this dangerous weapon. As the hunters head into the SAM's lair, they aren't sure whether they will find it or it will find them.

In the back seat of the F-100, known, because of its unique mission and electronics, as a Wild Weasel, Captain Jack Donovan, an Electronics Warfare Officer (EWO), is intently focused on his instruments. In the front the pilot, Captain Allen Lamb, scans the terrain and keeps the flight low. The four F-105s have spread out behind Lamb and Donovan. As they pop above the ridge, Donovan gets a bearing on a tracking radar and yells a warning over the intercom.

The flight drops back down to hide below the protective masking of the ridge. When the aircraft come to the end of the ridgeline, they are suddenly over a flat valley. The flight turns left and starts to climb. Strong radar signals are displayed on Donovan's scope in the rear cockpit of the Weasel.

Lamb climbs higher, scanning frantically. There--in a small village to the left--a control van camouflaged to blend in with a surrounding village, and several white missiles. He pulls up

sharply and rolls back down on them. He fires his two pods of rockets, but they hit short. Selecting guns, Lamb strafes the site with 20-mm cannon fire, explodes one of the long missiles, and pulls the sight up to the van. As he pulls up, the following Thuds roll in on their passes. The first SAM site in North Vietnam has been destroyed by a Wild Weasel-led attack.

The raid was a mere pinprick to North Vietnamese air defenses, but it represented the first use of specialized detection equipment cobbled together to detect the hard-to-find missile sites. The SAM wasn't a new weapon; it was first developed by the Germans during World War II, but not used in action. U.S. strategists had known about the Soviet-built SA-2 used in Vietnam since 1953. The missile was thought to have brought down Francis Gary Powers' U-2 spyplane in 1960, and one did destroy a U-2 flown by Rudolph Anderson two years later during the Cuban Missile Crisis. But the U.S. military did not begin to develop countermeasures until the missiles became a constant menace to U.S. aircraft conducting coordinated offensive strikes against North Vietnam.

SA-2 missiles were more than 30 feet long, carried more than 250 pounds of explosives, and could reach Mach 3.5 in pursuit of a target. Five months before Lamb and Donovan's mission, these weapons had drawn first blood: a flight of four F-4C Phantoms, climbing out from a strike north of Hanoi. One aircraft was destroyed and the remaining three sustained severe damage. In response, the Joint Chiefs of Staff directed a raid three days later against the suspected missile sites and supporting facilities, inside the once-restricted zone of Hanoi. The flight was mauled by anti-aircraft fire, and six aircraft were lost (see "Tullo and the Giant," June/July 1997).

Americans needed ideas, and the problem fell on Air Force Brigadier General K.C. Dempster, who began recruiting military and civilian technicians for a task force that met first on August 3, 1965. The urgency of the committee's task was brought home to them when a SAM claimed its first Navy victim--the pilot of a Douglas A-4 Skyhawk--shortly after the committee formed. Adding to the pressure, U.S. policy dictated that SAMs had to be faced after they were set up and operating. To the great frustration of U.S. air crews who watched the construction of SAM sites encircling Hanoi and North Vietnamese airfields, striking those missile sites, or even attacking cargo ships or trucks bearing the components, was not permitted.

Dempster's committee recognized that the most obvious danger was posed by the SA-2s, but it was the invisible waves emanating from the radars (code-named Fan Song by NATO) guiding the missiles--and from Fire Can radars directing anti-aircraft artillery (AAA)--that represented the key problem to technicians devising effective countermeasures.

After first setting as a priority a reliable radar detection system, the team discovered that the technology already existed. Two radar homing and warning (RHAW) systems had been developed in response to an earlier Air Force requirement and were already in limited use in secret CIA air operations. Bendix had developed one system, and a small, relatively unknown company, Applied Technology, Inc., had produced a system packaged in five small gray boxes. The equipment, designed to help large aircraft avoid and jam radar, was called a Vector Sector, and it provided the basic electronics that could be used for offensive operations against SAM sites. Because the signals required to shield a large aircraft required so much power, the existing designs placed antennas strategically so that the jamming signals could be directed only where needed. "That [equipment] was in use at the time that all of the excitement began with the SAMs' arrival in North Vietnam," says Mel Klemmick, a former ATI field engineer. "There were certain people in the Air Force involved in those programs and they were aware of the capability, but no one could talk about the capability. We were the builders of both the jammers and direction-finding equipment, and we took a Vector Sector and repackaged it and gave it another number." But even before the equipment--which was designated the Vector IV system--had been designed, the elusive signals had to be analyzed and interpreted. "Unacknowledged, I think, is the work that went on in the background to break the codes for the guidance signals," Klemmick says. "There was a lot of coordination between the intelligence community and companies involved--more than just ATI--coming up with a way to figure out what those original guidance schemes were."

The two-seat North American F-100F was selected to undertake the new mission. The F-100 (or "Hun," short for "hundred") was the Air Force's first supersonic fighter and was loosely derived from the legendary F-86 of Korean War fame, but by the time it was flown in Vietnam, it was being outpaced by newer and faster fighters. John Paup of North American Aviation was named program manager. Given the urgency of the situation, a meeting was quickly organized with ATI representatives in August 1965 to hammer out an agreement, and in an unorthodox manner that was to live on in Wild Weasel lore, the details were written on a chalkboard in a briefing room, signed by the authorized representatives, and photographed as the binding contract.

Under the cloak of a top-secret classification, an F-100F was rolled into a hangar at Long Beach, California, and placed in the care of North American's Kay Bullock, who had to find a place to stash the five boxes that made up ATI's system. Klemmick remembers Bullock's encyclopedic knowledge of the F-100 as vitally important, especially when first installing, and later repositioning, antennas after the Weasels had been deployed to Korat, Thailand. "He knew those airplanes so well that he'd take a big two-and-half-inch-diameter hole cutter, walk up to an

airplane, and start drilling into the side of it," Klemmick says. "And the line chiefs are going, "Oh my Godthe fuel lines are in there.' "No,' he'd say, "I know exactly where I'm cutting.' And sure enough we'd shove an antenna there. No problem behind it."

The Vector IV system consisted of an array of small antennas mounted on the airplane to receive signals from every quarter. A panel of warning lights was mounted in the cockpit to indicate the type of signal being received: SAM, AAA, or conventional surveillance radar. A three-inch, television-like cathode ray tube was installed in each cockpit to provide a graphic indication of direction to the signal source. A WR-300 launch receiver, which was tuned to detect the burst of energy specific to a SAM launch, was connected to a bright red light in the cockpit, guaranteed to get the pilot's attention. Wild Weasel crews later referred to it as the "Oh shit" light.

The installation was crude and fast, and made use of commercial-grade wiring and other off-the-shelf components, but it enabled the first F-100F to be ready to fly in just 10 days. The system worked as advertised with only minor tweaks, and three more F-100Fs were rolled in for the same modifications. They were redesignated EF-100Fs for "electronic fighter," and flown to Eglin Air Force Base in Florida, where five volunteer crews selected to evaluate the system joined them on September 4, 1965.

Crew training was conducted at Eglin, which featured a full-scale Fan Song radar simulator being used to train B-52 Stratofortress and B-58 Hustler crews in electronic countermeasures techniques. The pilots and EWOs were encouraged to get to know each other and select their own partners, and there were adjustments to make all around--single-seat fighter pilots were not used to having another crewman on board, and most of the EWOs (soon to become known as "bears") were completely new to fighter operations. Bears were experienced EWOs, drawn mostly from B-52s and EB-66 electronic warfare aircraft.

At Eglin, the new equipment installed in the F-100s was constantly modified and adjusted even as new systems, some of them to be fielded on future aircraft, were still under development. It was at Eglin that Bob Klimec, an Air Force pilot and electrical engineer, solved some of the basic problems associated with pinpointing SAM sites, and developed the basis of a defensive system that would eventually be installed on different aircraft types, including the F-111 "Aardvark," which was soon to make its debut in Vietnam.

Klimec set out to improve on the existing RHAW system, which only told you that a SAM was looking, or launching, and gave only a general bearing to the radar source. At this early stage in anti-radar development, before specially designed missiles that home in on radar signals were

available, the target still had to be visually acquired and attacked with conventional weapons like rockets, guns, or bombs.

The Fan Song was one of the first electronic scanning radars--it directed its energy without having to move its antenna. "The way the Soviets built the Fan Song was to have [one] radar that tracks both the aircraft and the missile," Klimec says. "It would scan across 20 degrees and then go off the air, because you had to shut the radar down in order to preclude any kind of problems with the energy coming back inside and blowing out equipment--and then it would fly back, come back on again, and scan 20 degrees, and go off the air." The radar cycled several times per second and was directed so that a targeted aircraft was located at the center of the scan sector, which enabled the missile to be maneuvered freely inside, while the target was simultaneously tracked by the radar.

"So it dawned on me that if we could detect when the radar came on, and we could determine when the aircraft was illuminated on the radar in the main beam, and we could detect when the radar shut down to fly back, we could calculate the position of the plane relative to the scan sector," Klimec says. It was known that the Fan Song took about 100 milliseconds to complete a scan, so if an aircraft was "painted" by the radar 50 milliseconds after the radar turned on, the aircraft was in the mid-point of the scan sector. "And the aircraft ordinarily did not get to the center of the sector unless somebody put him there--and since the tracking scan system could only track one aircraft to make an intercept on one aircraft, if you found yourself in the center of the scan sector and you found you stayed there, then you knew somebody had selected you as a target," he says.

After design engineers devised equipment to verify Klimec's theory, he began monitoring the Eglin Fan Song simulator's emissions from the top of a hangar. "I talked on the phone to the radar site and got them to move it a little bit, and we verified that we could detect when the radar came on to start the scan, we could detect when it went off the air, and we could detect when we got the large spike of energy as the main beam came by," Klimec says. Klimec's innovation eventually allowed fighter crews to know whether or not they were targets and to take action only if they were.

By the middle of November 1965, the Wild Weasels were committed to cutting their teeth in combat. Four EF-100Fs, led by Major Garry Willard, arrived at Korat Royal Thai Air Base on Thanksgiving day after a turbulent flight from Hawaii. Only 84 days had passed since the first F-100 had rolled into a hangar for transformation. But the equipment and tactics had yet to be

proven. "Everything that went with the first contingent and with the first Weasels was all unqualified equipment," says Bill Hickey, a former ATI technician. "The need was so great we didn't have time to go through all the qualification testing and all that. And it worked, so who cared? But the biggest problem that anybody had was tactics, because nobody knew what the hell to do."

The North Vietnamese Army had not been idle while the Weasels were forming--U.S. air losses had been heavy. With the help of Russia and China, the NVA had developed a system of coordinated and layered air defenses that could be supplied and expanded at will, since President Lyndon Johnson had ordered that North Vietnamese harbors and rail links into China be off-limits to U.S. forces. NVA air defense depended on SAMs to dominate the medium to high altitudes, which caused the fighters, in their dive to elude missiles, to fly into a waiting hail of AAA, much of it radar-guided and accurate. The AAA became thicker the lower the altitude, and below 4,500 feet it became more lethal than the SAMs themselves. The plan was simple: Drive the attackers down into the lethal envelope, where they would be destroyed.

By December, the small cadre of Wild Weasel crews began checking out their equipment and devising tactics for their first missions. The crews flew orientation flights along the North Vietnamese border and became familiar with the various electronic signatures of NVA radar. When the Huns did head north, they accompanied strike packages to targets selected by the air staff. Intelligence about the location of SAMs wasn't always accurate, since the sites were mobile and could be broken down and moved in four to six hours. Wild Weasel missions were code-named Iron Hand.

As the Weasels flew, field engineers from ATI and North American were back on the ramp at Korat, working alongside Air Force crew chiefs and technicians under primitive conditions and dealing with constant changes to equipment and installation of subsystems. "We got into the field where they're changing engines out all the time and the wiring was deteriorating really badly," says ATI's Mel Klemmick, who was sent to Thailand in 1965 for a tour that was to last 30 to 90 days but ended up stretching for two years. "Towards the end they were really falling apart. For example, you use commercial-grade coaxial cable for the rear antennas running right on the tops of those engines where the afterburners were. And particularly when they started flying the 100s out in front of the F-105s, those poor guys were in afterburner all the time."

Because they often worked in concert with faster F-105s and F-4 Phantoms, even by the time the Weasels arrived in Thailand it was clear a more capable airframe was needed. Both the

Thunderchief and the Phantom were logical choices, but the Phantom was a much more complicated machine: With twin engines, multi-role mission capability, and an extensive array of weapons to carry, it was much more densely packed with wiring, cables, and systems. Just finding space for the Weasel equipment was a challenge. Once the systems were installed, technicians discovered incompatibilities with the Phantom's existing electronics. Because of its difficult development and a string of intervening cease fires in Vietnam, the first F-4C Wild Weasels wouldn't reach Korat until 1972.

The conversion of the Thunderchief was much more successful and was to result in the most storied Wild Weasel airframe, and one that would fly the most missions in Vietnam. By January 1966, the first modified F-105F, with essentially the same equipment as the F-100F, made its first flight. The big Thunderchief had come out of the shop with its 20-mm Gatling gun still in the nose and the added ability to launch a new air-to-ground missile that fed on radar beams, the AGM-45 Shrike, a weapon that was partly based on the AIM-7 Sparrow air-to-air missile but had a Texas Instruments seeker head that locked on to ground-based radar sources. The Shrike was eventually carried by other U.S. Air Force aircraft, and was used by Navy radar suppression aircraft, including A-6 Intruders and A-4 Skyhawks; its appearance marked the beginning of more widespread SAM supression and offensive capability for a host of aircraft operating in Vietnam.

By May 1966, ten F-105Fs were on the ramp at Korat, bolstering the battered EF-100F contingent. The Thuds were flying sorties by early June, led by experienced crews in F-100Fs. When the Huns were withdrawn in July, they had proven the new system worked, pioneered a new mission, and destroyed nine SAM sites.

In mid July, the first Thud Weasels arrived at Takhli Air Base in Thailand. The air war was heating up at an incredible pace, and within six weeks, five Weasels had been lost and the sixth was too badly damaged to fly again. Operation over the north reached a long bloody plateau from late 1966 through early 1968. In 1967 alone, 26 Wild Weasel aircraft and 42 crew members--the equivalent of an entire squadron--were shot down. The losses prompted a reexamination of whether Weasel operations should be continued at all.

The surviving crews from the first deployment were sent to Nellis Air Force Base in Nevada to set up a Wild Weasel prep school that would provide new crews with instruction on the Vector IV equipment and 10 missions in the F-105F, some of them flown against dummy SAM radar sites. But for Wild Weasel crews, the best lessons were learned in combat. The training gave

crewmen the basics of operating the equipment and included classwork on SAM radar and tactics, as well as simulated missions flown against the radar simulator. "We could learn how they operated, but actually seeing how they turn on, and seeing [a SAM] fire off and go by you [in combat] is another experience," says former F-105 backseater David Brog. "But [the school] prepared us and we were trained by guys who had been there already."

The crews experimented freely and developed their own tactics, even as their onboard equipment was continually modified. One of the more successful maneuvers against SAMs was developed by Takhli-based Weasels, who began forming teams made up of two pairs of aircraft: One tempted a SAM to fire, which revealed the site for the other pair to attack. This was a favorite trick of Leo Thorsness and his EWO Harold Johnson, a tactic they called "trolling." Thorsness also pioneered the lofted delivery--a sharp pull-up during launch of the Shrike that added as much as 20 miles to the nominal range of the missile. Thorsness and Johnson flew 92 Wild Weasel missions, one of which earned Thorsness the Medal of Honor and Johnson the Air Force Cross, but the two were shot down by a MiG in 1967 and spent the rest of the war as prisoners in Hanoi.

As tactics were developed in the air, field modifications to the Wild Weasel systems continued on the ground. A key weakness of the equipment was that if several SAM sites were displayed on the scope and the light that signaled a launch was illuminated, there was no way to know which site had fired and from which direction the SAM was coming. "I heard the crews complaining about that," says Weldon Bauman, who in 1967 was a junior enlisted technician at Takhli. "And I thought Well, if I knew more about the signal, then maybe we could do something about it." Bauman became a Wild Weasel legend for devising a system similar to Bob Klemic's but that sidestepped cumbersome and lengthy procurement procedures and could be hot-wired into the aircraft in the field immediately. But to do it, he first needed access to sensitive data about the nature of SAM site radar emissions, and after convincing an EWO to escort him into the intelligence section, he got the information he needed. "I sat down and got the real-time data--the same day then was real time," Bauman says. "I found out what they were seeing and then went back and designed a circuitand it worked." When activated, Bauman's modification cleared the scope of all information except for a blip that indicated the launching site. Tom Wilson, a former F-105 EWO, marveled at Bauman's ingenuity and his modesty. "This kid had two stripes, and he was so damn smart it was unreal," Wilson says. "When I asked him how he came up with the mod, he said, "It was real easy. Just three little parts wired into the line for the scope, and a switch, and it was done.' "

However, such advantages were sometimes short-lived. "I've been asked to describe electronic warfare to new guys coming on board in the industry, and I tell them that you've got to look at it as a giant circle," former ATI technician Bill Hickey says. "You make changes because you want to improve your equipment. Well, the instant you do that, and the guy on the ground finds out, he's going to make a change."

Often it didn't matter if the air crews knew where the SAMs were coming from--there were too many to effectively track. "Somewhere along the way, someone convinced the NVA to fire the SAMs in threes, and that is what they would do," Wilson says. "So, here comes three from one side, three from another, three from behind, and they are all pointed at you. It made for tough decisions." Some air crews witnessed a further step taken in the electronic gamesmanship: simulated SAM launches. "We used to joke about the Russian technician teaching the NVA and saying, "See that big formation right there on the scope? Well, watch this,' " says Bill Sparks, a former F-105 pilot. "He would hit the button, and the formation would look like the world's biggest bomb burst as everyone jettisoned their loads and went crazy looking for a launch. Kinda funny, really."

As the air crews gained experience monitoring the signals coming from Fan Song radars, the abilities, tendencies, and personalities of certain ground operators began to emerge, sometimes evoking grudging admiration from pilots and EWOs. One such site was located at Vinh, North Vietnam. "In my day, that guy was famous," says former F-105 Weasel pilot Jerry Hoblit. "He was isolated from everybody else. He was the cagiest guy in the world. You talk to anybody who flew when I was there and they say, "I want to meet the guy that ran that [site] and buy him a drink.' "

Hoblit vividly remembers being trumped by the Vinh operator during a night mission. "I had a preplanned strike launch all figured out coming off the water, where I used the radar and got a good range on him," Hoblit says. "So I was doing this trick and it was a pretty high angle. I think I was launching [a lofted delivery of the missile] around 30 degrees. And right after I launched that Shrike, I'm still kind of floating and up comes the Fan Song [transmitting a launch signal]. I'm all out of airspeed and about everything and it's night, and I'm over an undercast everything went from good to bad in an instant. And Tom [Wilson, Hoblit's EWO] is yelling at me, calling me a very bad name." Hoblit doesn't think the operator actually fired a missile at him, but knows his own attack against the Vinh operator failed miserably. "That was typical. I wasn't so dumb. He was just smart," Hoblit says.

Despite the heavy toll on Wild Weasel crews in Vietnam, losses of all types of aircraft to SAMs began to decrease in 1967. In addition, by late 1966 components from the original Wild Weasel equipment were being installed in many aircraft types, which provided the pilots of non-Weasel aircraft some measure of radar detection and enhanced their existing ECM equipment. The F-105 and the technology developed for its use had finally begun to pay off and turn the tables somewhat against the dreaded Fan Song and SAM.

Missile technology improved also. In 1968 the USAF introduced the 15-foot-long AGM-78 Standard ARM, which was designed around a Navy shipboard surface-to-air missile. Later improvements to the missile enabled it to lock on to a radar signal up to 60 miles from the source. The Standard ARM was used in combat most extensively by the F-105G, which came with better electronics and built-in ECM equipment that eliminated the need for external jammer pods.

Under development in the closing stages of the Vietnam War, the ultimate Weasel, the F-4G, would offer an all-new McDonnell-designed system built around a Texas Instruments computer board. Target and threat information was projected on a head-up display on the pilot's gunsight. The F-4G could carry both Sparrow and Sidewinder air-to-air missiles, plus all air-to-ground missiles, including the new High Speed Anti-Radiation Missile, or HARM.

The F-4G, a product of lessons learned during Vietnam, operated in the Gulf War and served until 1996. The overwhelming success of allied air operations provided a fitting end to the Wild Weasel--Desert Storm represented everything that Vietnam, with its mix of politics and warfare, wasn't. No Wild Weasel aircraft were lost, and today F-16s have assumed the Air Force's radar supression role--they use bolted-on targeting pods housing radar acquisition equipment in a compact package that works in concert with the AGM-88 HARM. A variety of Navy and Marine Corps aircraft also carry the HARM. The F-16 will be followed by the Air Force's newest fighter, the F-22 Raptor, which will likely have an integrated anti-radar capability. It may take another war, one more like Vietnam than Desert Storm, to prove whether a targeting pod slung under a wing can match a dedicated Wild Weasel air crew. When tomorrow's pilots test the wisdom of the decision, they'll carry with them the heritage of a courageously executed mission, equal parts planning and improvisation.