

Over hostile territory, it's essential to destroy, disrupt, or degrade the enemy radar.

Slam 'Em and Jam 'Em

BY JEFFREY P. RHODES, AERONAUTICS EDITOR

PHOTOS BY GUY ACETO, ART DIRECTOR

ELECTRONIC combat is a tough game to play," says Col. Richard Hellier, Commander of the 366th Tactical Fighter Wing at Mountain Home AFB, Idaho. "Except it's not a game."

Electronic combat is a difficult concept to grasp. Because of its "electron-vs.-electron" nature, it can't be seen or touched. With the exception of destroyed enemy radar emitters, there is no physical evidence after an electronic battle. Success in the electronic battle, however, determines the success or failure of the overall mission.

Electronic combat takes many forms, but the primary tactics employed to get a force package of fighters or bombers into a target area is a combination of radar equipment destruction, signal elimination, and jamming to achieve radar suppression.

Airborne jamming began during World War II when aluminum strips called chaff or "window" were thrown out of bombers by the bale to confuse German radars. Today, jamming (obliterating radar returns by more powerful emissions on the same wavelength) is more complex,

simply because of the larger number of emitters working on a multitude of frequencies.

Individual aircraft carry self-protection jammers (and chaff, too) into combat to ward off radar-directed anti-aircraft artillery (AAA) and air-to-air and surface-to-air missiles (SAMs). Jamming over a wide area to mask an incoming strike package from enemy radars, though, requires the power of the Air Force's Tactical Jamming System (TJS), the EF-111A Raven.

Radar suppression was a response to Soviet-built SA-2 SAMs and "Fan Song" radars that the North Vietnamese used to down American planes in 1965. Eighty-nine days after initial development, four North American F-100Fs modified with radar homing and warning receivers and other equipment arrived in Thailand to begin "Wild Weasel" operations against the radars and SAMs. After a rocky start, the Weasel program developed into an outstanding success using Republic F-105F and F-105G and McDonnell Douglas F-4C aircraft.

Radar suppression was described by one Vietnam-era pilot as "three-



The beginning and the end of another busy day on the ramp at George AFB, Calif. At right, SrA. Robert Collins makes sure the Texas Instruments AGM-88A High-speed Antiradiation Missile (HARM) is securely attached to its launch rail while preflighting "his" F-4G. With its standoff range and devastating accuracy, HARM is the weapon of choice for Wild Weasel crews. Above, a 37th TFW electronic warfare officer climbs out of his office at the end of a training sortie.



dimensional chess where cheating is legal." It is the same today. "The Wild Weasel fundamentals haven't changed since Vietnam," notes Col. Bill Payne, Vice Wing Commander of the 37th TFW at George AFB, Calif. "Electronically, there is a world of difference."

Different But the Same

While targeting and jamming are quite different, there are many similarities. At the top of the list, both missions are dangerous.

The Wild Weasel crews play a continuous cat-and-mouse game with enemy radar, trying to get it to "come up" (turn on) so the electronic warfare officer (EWO) in the F-4G's backseat can find the site and destroy it, or to make the radar operator so fearful of attack that he does not turn on his set.

"If we get the radar to shut down, we're doing our job, even if it is just for the minute or so we're there," says Lt. Col. Les Moore, Assistant Deputy Commander for Operations for the 37th TFW. "They turn off, and the force package can get in."

The Soviets have developed successive generations of increasingly sophisticated radar, AAA, and SAMs. This has forced the Weasels to operate at lower and lower altitudes. "We've had to go lower since Vietnam, often as low as 100 feet," says Capt. Tom Finke, an EWO with the 37th TFW's 561st Tactical Fighter Squadron. "The front-seater has no time to look inside [the cockpit]. Make a mistake and in two seconds you are in the ground."

The EF-111As, meanwhile, are unarmed. The Ravens are just as susceptible as the Weasels to ground threats. Unlike the F-4Gs, which carry air-to-air missiles, the EF-111s don't have any means of defending themselves except for a terminal jammer and speed. "At 600 knots, EF-111s are not lucrative targets," says Capt. Greg Menke, an instructor EWO with the 390th Electronic Combat Squadron at Mountain Home AFB. "Speed is life."

A second similarity is that both missions are task-intensive and task-specific. When standard F-111As were redone as Ravens, all navigation and communications equipment was moved from the

right-seater's station to the center console. This allows the aircraft commander to do everything necessary to fly the plane during the height of combat while the EWO tends to the jamming.



The 390th ECS at Mountain Home AFB, Idaho, represents the nonlethal side of electronic warfare—radar jamming. EF-111A crews can jam transmissions in several ways. Above, A1C John Moore and Sgt. Curtis E. Sargent prepare an EF-111 for one of the uprated TF30-P-109 engines now being fitted to the Ravens.

"In the F-4G, the backseater is the key guy," adds Colonel Moore. "He determines the order of battle. He determines the order of battle. It's really EWO-intensive. 'Weasel-ing' is a team-oriented concept. We are tied to the force package in a supportive role. We don't just go out and destroy radars. We have to be in support of some specific objective."

Another "given" is that nothing in electronic warfare is as constant as change. "All electronic warfare is essentially reactive," notes Colonel Hellier. "We see a potential adversary develop a capability, and we have to move to counter it."

For electronic combat to be effective, the Weasels, Ravens, and other aircraft, such as EC-130H Compass Call communications jammers, have to be used together. But that highlights the limited numbers—forty-two EF-111s and fewer than 130 F-4Gs—of each of the electronic warfare assets. "We don't try to spread the Weasels out along the whole FEBA [Forward Edge of the Battle Area]," says Colonel Payne. "We want to mass our forces in one area at the proper time."

Demanding Missions

The combination of scarce airframes and demanding missions requires that the Weasel and Raven crews be among the most experienced in the Air Force. In the past,

an EWO needed at least 500 hours to become a Weasel, and pilots for both the F-4Gs and EF-111s needed at least 1,000 hours coming in the squadron door. These requirements have been lowered slightly, but not much.

At George, crews go through the Replacement Training Unit (RTU), the 562d Tactical Fighter Training Squadron, which takes an average of four months. The 562d TFTS also trains crews for the other Wild Weasel units—the 52d TFW at Spangdahlem AB, West Germany, and the 3d TFW at Clark AB in the Philippines.

Mission-qualified F-111 crews go through two levels of training before becoming full-fledged Raven operators. "It takes one year to [prepare] a mission-ready crew member," says Lt. Col. Rich Meeboer, the 390th ECS Commander. "Even then, he is not really ready—we are just scratching the surface." The 390th ECS is also the EF-111 RTU. There is only one other Raven squadron in the Air Force—the 42d ECS at RAF Upper Heyford, UK.

Close coordination is needed between pilot and EWO in both air-



AIRPLANE

EWO
CAPT GRAY
ASST CREW
SGT MOORE

042

Spirit of Idaho



planes. Thus, a crew is paired off more or less permanently. A pilot and EWO in the two operational Weasel squadrons at George, for example, will fly with each other more than seventy percent of the time.

Weasel and Raven crews both have the same basic objective—to disrupt the Soviet Integrated Air Defense System (IADS). The goal is to get a radar emitter to “go autonomous,” that is, to break out of the chain of radars that are linked to provide a coordinated defense. Once isolated, the radar can be dealt with. If the radar is destroyed, it is no longer a threat. If the radar is jammed or shuts down, that creates a hole for the strike package. Either way, the effectiveness of the entire IADS is degraded.

Opening holes in the FEBA is the

gence is just a little different. We have to tell our crews not just, ‘There is a target here.’ We have to tell them what kinds of radars, how they operate, and what frequencies they operate on.”

How They Operate

The Wild Weasels operate in hunter-killer teams of two aircraft, an F-4G with an F-4E at George and Clark and an F-4G with an F-16C at Spangdahlem. (The latter combination may be the wave of the future.) The F-4G “hunters” find the emitters with their equipment and then launch ordnance, or the information is passed to the “killer” aircraft, which can’t find the emitters on their own but can certainly attack them.

The weapon of choice is the Texas

ous AGM-45A Shrike to be used by the “killers.” In the inventory since Vietnam, Shrike has a range of about three miles, which brings the aircraft closer to the SAMs and AAA. A “loft” delivery, where the “killer” pulls up and launches, gives the AGM-45 a little more range.

If a war lasts long enough for the Weasel crews to run out of HARMs and Shrikes, the next weapon to be used would be the AGM-65D Imaging Infrared Maverick. Principally an antitank weapon, Maverick’s devastating accuracy would work well on a radar. After that, it’s down to iron bombs and directly overflying the target, which is a method that crews would just as soon avoid.

The heart of the EF-111A is the AN/ALQ-99E jamming system, a version of the ALQ-99 used in the Navy’s EA-6B Prowler. The receivers and antennae for this system are located in the “football,” the blunt pod on the tip of the aircraft’s fin. The transmitters are housed in the “canoe” on the belly. The processors and other equipment are permanently installed in what was the F-111’s weapons bay.

Unlike the system in the EA-6B, which requires three crew members to operate, the EF-111’s jamming system is much more automated and requires only one EWO. The Intelligence Support System (ISS) is a computerized program that provides information about radars in the area where the Raven crew will be working. Before the start of the mission, ISS data are fed into the Mission Data Generator (MDG) and then loaded into the aircraft via Raymond cassette.

Through the use of the MDG, the Raven’s computer system can determine what radar is “up,” its priority as a target, and how to jam it. The computer can jam automatically, or the EWO can jam manually. The EWO also has the option of jamming other emitters as the situation dictates. Where there is an air-to-air threat, the EWO will let the computer take more of the work load so he can get his head out of his console and help the pilot look for airborne “hostiles.”

There are three primary types of jamming. Standoff jamming blankets a number of emitters to mask friendly forces. Its primary advantage is to keep the EF-111s



Playing the electronic “bad guys” is a role the 392d Electronic Combat Range Squadron takes very seriously. Here, Sgt. Dan McDaniels (left) and Sgt. Hoyt Hagens track a target in the AN/MSQ-T43 Modular Threat Emitter, which accurately simulates Soviet anti-aircraft artillery and surface-to-air missile radars.

primary task for the F-4G and EF-111 crews, but both also train to go to the target with the force package. Europe will be an electronic jungle, and once the force flies through the first layer of defenses, the Weasel and Raven crews will be needed to go against threats both en route and surrounding the target.

Intelligence is vital for every operation, but it is paramount in the battle of electrons. “We will not send out Weasels without good, up-to-date intelligence,” says Colonel Moore. Adds 1st Lt. Paul Hylton, the 390th ECS’s Intelligence Officer, “Electronic warfare intelli-

Instruments AGM-88 High-speed Antiradiation Missile, or HARM. With a range of more than ten miles, HARM gives the Weasel crews a true standoff capability. The nearly fourteen-foot-long missile can be launched from a level delivery and greatly expands the working area for the Weasel crews. “The AGM-88 is a great weapon,” says Maj. Walt Michalke, a pilot with the 561st TFS at George. “You launch it, and there’s a pretty good chance of its hitting what you want it to hit.”

HARM’s only negative is that it is not overabundant. That leaves the older, less reliable but more numer-

away from the thick of enemy defenses. Close-in jamming obscures radars in a specific area to open a corridor for the strike package and increases the Raven's exposure to surface threats. The third type is escort jamming, wherein the EF-111s protect the strike package all the way to the target, as in the 1986 USAF/Navy reprisal raid on Libya.

Preparing to Go

Maintenance for the F-4s (and the EF-111s as well) is a labor-intensive activity. "You are definitely a crew chief on an F-4," noted TSgt. Mark Mantz, a crew chief with the 37th TFW's 563d Aircraft Maintenance Unit. "You know you will have to work hard. On some newer aircraft, the crew chief is a glorified gas-station attendant, but not here."

All of the George F-4Gs are 1969 model F-4Es that were converted to Weasels, so while some of the electronic equipment is new, the airframes and most of the electronics are not.

One major problem is parts. "I have to spend a lot of time on the phone trying to get spares," says SSgt. Charles Clark, the assistant NCOIC maintenance supply liaison for the 37th TFW. "We have to get some things out of AMARC [Aerospace Maintenance and Regeneration Center at Davis-Monthan AFB, Ariz., where old aircraft are stored]. Getting parts for the G-models is particularly hard. It gets hairy at times."

Likewise, the EF-111 airframes are old. The F-111As, from which the EF-111s were modified, were built in 1966-67, but Grumman did not make the electronics modifications to the aircraft until the early 1980s. The electronics are of a newer, modular type and are fairly easy to repair or replace. Finding parts for the airframe is a problem, but such parts are more plentiful than those for the F-4, which the Air Force is phasing out of the inventory.

Despite the hurdles, the maintenance sections for both units are getting the job done. The Fully Mission Capable (FMC) rate for the 37th TFW's aircraft was 52.8 percent in 1982. Last year the rate was 82.6 percent. The Mission Capable (MC) rate, which allows some sys-

tem degradation, is around seventy-seven percent for the EF-111s, a dramatic increase from just two years ago. These percentages come despite the EF-111s' having among the highest utilization rates in the Air Force. The F-4Gs also see a great deal of use.

New technology is one reason matters have improved. The Weasel Attack Signal Processor (WASP) part of the APR-47 system that was recently installed in the F-4Gs is much more reliable and easier to fix than the APR-38's Homing and Warning Computer (HAWC) it replaces. It is also easy to change the software to keep the system current. The AGM-88 can be bench-tested with a single connection to the DSM-160 computer, which in minutes can run a complete diagnostic test on the missile.

There are also many easier, smarter ways of doing things. "We have to assemble the AGM-45s in the field," says MSgt. Stephen Cotta, Assistant Chief of the 563d Combat Munitions Unit. "It's like a big Erector Set. The guidance and control sets have to match up or the missile won't work." The HARMs come as all-up rounds—just add fins.

"We are doing very well, maintenance-wise," says Col. Robert "Slick" Andrews, Deputy Commander for Maintenance at Mountain Home. "Dedicated people make it happen."

The keepers are rewarded for their efforts in several ways. At George, if a squadron meets its sortie goal for a month, the AMU gets the day off. Both the 37th and 366th TFWs offer orientation rides as an incentive to the maintainers. "When deployment season comes, our guys are ready to go," says Capt. Lee Cherry, officer in charge of the 390th AMU at Mountain Home. "We go to Korea, Puerto Rico, and Europe. We thrive on that."

Deployment is not just an occasional thing with these two units. The Weasel and Raven crews participate in every Joint Chiefs of Staff exercise and in every Red Flag and Green Flag exercise at Nellis AFB, Nev. The Ravens deploy overseas periodically and are frequent guests at Navy exercises, adding a new wrinkle to what the Navy electronic warfare players usually see.

Ready for Anything

Another unit at Mountain Home that spends lots of time on the road is the 392d Electronic Combat Range Squadron. This small, specialized unit functions primarily as the ground "aggressor" force for the Raven crews, but it also trains many other units. The radar operators simulate the Soviet IADS and take it personally when they get jammed or "destroyed" by strike packages on training missions.

The unit has established one training range at Saylor Creek, Ida-



Mountain Home's EF-111s have one of the highest utilization rates in the Air Force. This Raven is being "Euked" (towed) from the maintenance hangars out to the flight line. The "football" on the vertical fin and the "canoe" on the belly house the receivers and transmitters that make the EF-111s so effective.

Close coordination between pilot and electronic warfare officer in both Wild Weasel and Raven aircraft is essential. This team concept is illustrated here, as Lt. Col. George Osborne flies the F-4G and looks for threats while Capt. James Avrit has his head in his console searching for radar emitters on a training sortie over a range in the California desert.



ho, with another under construction, but the 392d ECRS also goes on approximately thirty deployments a year. These deployments range from two people and no equipment at a Red Flag exercise to as many as sixty people and twelve radars at the Dugway Proving Ground in Utah for a joint force deployment.

The squadron has nearly thirty different radar systems with which to train. "All of the radars are American-made," says Lt. Col. Carl Newman, the Squadron Commander. "The part of the operation that looks like the Soviets' is the RF [radio frequency] part. But we have a tough time keeping them up because some are so old." The Soviets seldom retire anything, but merely pass it on to their client states. A 1949 model MPS-9 radar given to the Soviets under World War II Lend-Lease is still used in some parts of the world, so today's crews still have to train against them. Another radar set used by the unit was found in a museum.

The unit regularly works with the intelligence section to keep current in the Soviet order of battle. Intelligence also helps with aircrew ground training. "We prepare the crews to fight a war in a different part of the world each month, so they are ready for anything," says Lieutenant Hylton. "You also see a lot of pilots and EWOs coming in to do self-study."

Mission academics at both George and Mountain Home is taught under contract by civilians working for McDonnell Douglas Training Systems Inc. At George, there is a G-suit/G-seat Weapon Systems Trainer (WST) operated by CAE Link. The simulator doesn't allow for two-ship or tactics work, but does provide highly realistic mission simulations for aircraft procedural training. There is a WST at Mountain Home, too, and the EWOs also have the opportunity to practice jamming procedures on an elaborate part-task trainer (PTT).

There are a number of changes being planned for the Air Force's electronic warriors. The 37th TFW is scheduled to be merged with the 35th Tactical Training Wing (the F-4 "schoolhouse"), also at George. Once the consolidation is complete, the new wing is tentatively scheduled to move to Mountain Home, probably in 1992. This will mean that most of the Stateside electronic assets will be in one place. George AFB is expected to be closed.

To make room for the Weasels, the two F-111A squadrons at Mountain Home are scheduled to be transferred to Cannon AFB, N. M. While Mountain Home has the ramp space for the expected F-4s, new facilities will be needed. "There appears to be justification for another runway, given the number of aircraft movements per hour," says Col. Ron Kroop, the

base civil engineer. (Mountain Home has only one active runway.) "The number-one priority is housing and feeding the 2,000 additional military people."

In the meantime, incremental changes are being made to the Weasel and Raven aircraft. The EF-111s will be getting new instruments, terrain-following radar upgrades, global positioning system equipment, and a new inertial navigation system under the Avionics Modernization Program for all F/FB-111s. The EF-111s are now getting the uprated Pratt & Whitney TF30-P-109 engines. A program to integrate HARMs into the EF-111 to increase its lethality (and survivability) is in the idea stage.

Several electronic upgrades have been proposed under the Weasel Performance Upgrade Program, but the Air Force is increasingly turning its attention to a Follow-on Wild Weasel platform. Several candidates have been proposed, including derivatives of the McDonnell Douglas F-15E, General Dynamics F-16D, and the Panavia Tornado, which would be built in the US by Rockwell. A decision is expected in the early 1990s.

One thing is certain. "The [electronic combat threat] situation will do nothing but get worse," concludes the 390th ECS's Captain Menke. "We can't disregard it. We have to get better with it. It is not going to go away." ■