R&D News

An Improved Hawk Concept

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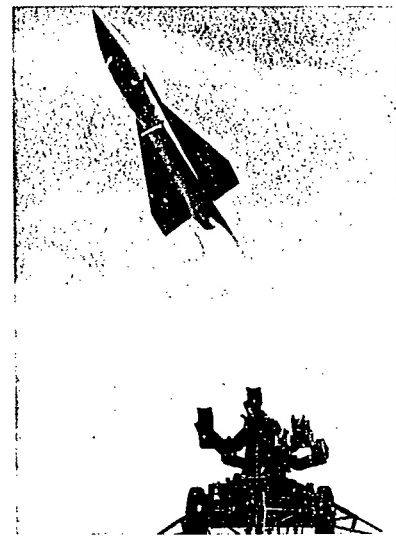
The only surface to air missile (SAM) system currently in use by the Marine Corps to provide for air defense against attack from medium and low altitude, high speed aircraft is the Hawk. While the name Hawk is sometimes used as an acronym for the term "homing all the way killer," the name actually was acquired during the earlier days of missiles and rocketry, when missiles and rockets were classified according to their characteristics and capabilities. At that time, Hawk just happened to be in the category named for birds of prey.

Basic Hawk was initially in production as early as 1958, but saw its operational beginning in the Marine Corps after months of intensive training, in late 1960 when, at the Marine Corps base, Twentynine Palms, California, the first light anti-aircraft missile battalion (LAAM Bn) was activated. Since that time, the number of Marine Hawk missile battalions rose at one time to a total of five; four on active duty and one in reserve. Recently, one of these battalions, the fifth, has been deactivated leaving the Marine Corps with a total of three active duty battalions and one in reserve. A Marine Hawk battery from Third LAAM Bn was deployed to Guantanamo Bay in 1962 during the Cuban crisis. Until recently, two Marine Hawk battalions were deployed in the republic of Vietnam. These two battalions hold the distinction of being selected as the first SAM units of all the allied service to provide a combat air defense capability against possible enemy air threat in Vietnam. In addition, and in keeping with prevailing Marine Corps Hawk deployment doctrine, an abbreviated but equally lethal configuration of a Hawk battery, called the assault fire unit (AFU), the first ever to be deployed in combat, is still operational in Vietnam. While the enemy offensive air threat against South Vietnam has been slight, the Hawk missile battalions in country act as a deterrent and have the capability to further counter any air threat launched against the vital areas.

Not many people in the military today fully appreciate or understand the enormous variety of testing and evaluation that is accomplished before such a complex system as Hawk can be fielded. Fewer people are aware that, in most cases, these periods of testing and evaluation are generally joint efforts, participated in by two, and sometimes more, services or countries. These tests and evaluations are in a sense, a series of steps leading up to the ultimate, or highest step of all; reliability when required. The following is an account of a surface to air missile system currently under test and evaluation and the active role a small number of Marines will have in conducting some of the many functions necessary for complete and thorough testing and evaluation.

Four Marines, two captains and two master sergeants, all of whom had just returned from service with the two Marine Hawk Battalions in RVN, were assigned to the U.S. Army Air Defense Board, Fort Bliss, Texas, in the spring of 1968. This assignment is duty with the Army's improved Hawk missile system program. The Marines, jokingly referred to by Army personnel at the board as, "Our Allies," assist the Air Defense board in its service test and evaluation of improved Hawk. They also keep Headquarters Marine Corps constantly informed on the progress of testing, predicted and completed milestones, decisions and results of in-process reviews and significant changes or modifications to the system which might involve re-evaluation of current Marine Corps deployment and/or operational Hawk doctrine. As has occurred many times in the past with joint service efforts such as this, the senior Marine of the four finds himself the temporary head of the missile test branch at the Air Defense board.

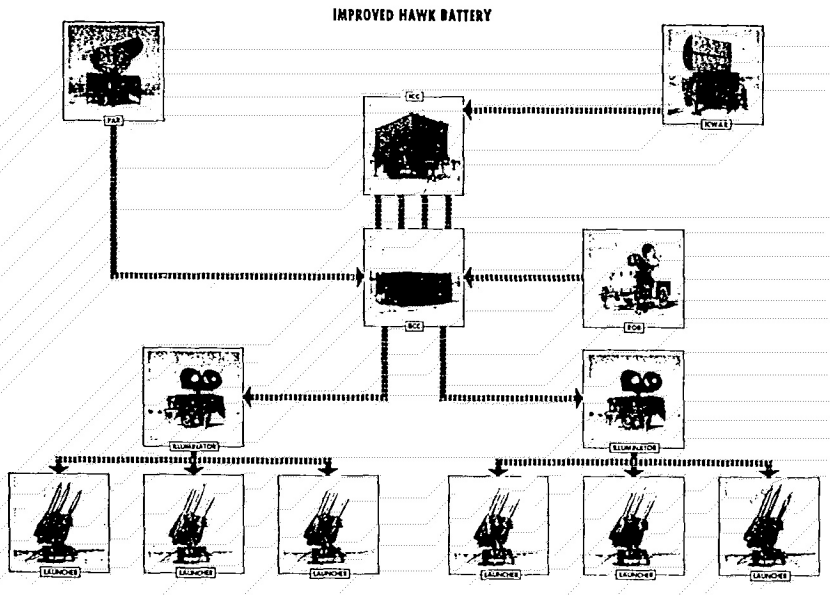
It was the job of the U.S. Army Air Defense board to put the seal of approval on basic Hawk years ago. Through the board's efforts, a total of four Army and Marine Hawk Battalions eventually were deployed in Vietnam. The following explanation of the mission of the Missile Test Branch, one of the many branches at the Army Air Defense Board, is intended to serve as a typical example of what transpires prior to releasing a complex system, such as Hawk, for field operations. The particular system discussed here will be the follow-on version of basic Hawk, presently known as improved Hawk. Some of the already completed preliminary testing of improved Hawk has at one time or another closely duplicated that which the basic system was subjected to. However, considerable testing peculiar to improved Hawk is still required which makes for a very respectable test schedule.



Briefly, the SAM system now known as improved Hawk began in 1959. After various changes during the engineering development phase, some of which included overall system concept and equipment configuration, improved Hawk emerged in essentially its present configuration in 1967. Improved Hawk has extended capabilities over basic Hawk commensurate with the increased air threat of the present time frame. Outwardly, system appearances remain the same as the basic Hawk configuration. Inwardly, improved Hawk has all the advantages and benefits the state of the art can provide: solid state circuitry as well as integrated circuitry with long life and decreased maintenance requirements, reduced system response time, reduced spare parts requirement, extended target speed handling capability and an automatic mode of operation.

Any item of equipment the U.S. Army buys, be it a mess kit or a system as complex as improved Hawk, must first undergo various types of testing before its suitability for use in the field is certified. Some of these tests are: Feasibility Studies and Tests, Research Development Testing and Evaluation (RDT&E), Research Development Acceptance Testing (RDAT), Engineering Testing (ET), and Service Testing (ST). The U.S. Army's ST is essentially comparable to the Marine Corps' troops test. Pertinent to the objective of this article are the ET and the ST.

The ET consists primarily of subjecting the system to a variety of controlled tests. Test parameters are very precisely planned and controlled, varied from one extreme to the other both in and out of artificially, but sometimes naturally, induced environments. All test phases are heavily instrumented. The



ET requires personnel highly skilled in planning and operating, testing recording, reducing data collected and technically evaluating the measured and recorded results. The ET for the improved Hawk system will be conducted primarily at the White Sands Missile Range (WSMR) New Mexico.

The ST consists primarily of placing the equipment under test in the hands of troops; ideally a cross-representation of the average missile system operators and technicians on active duty with the military today. In the case of the improved Hawk system, some of the areas to be tested and evaluated during the ST are: operability, reliability, maintainability, march order and emplacement times, sustained operations and compatibility with various ancillary equipments. Some of this ancillary equipment will include the following: battery terminal equipment, IFF radars, various Army fire distribution systems and the Marine Tactical Data System, MTDS. The ST will be conducted primarily in the Fort Bliss, Texas area.

On 27 November, 1968, the U.S. Army Missile Command (USAMICOM), the commodity command for improved Hawk at Redstone Arsenal, Alabama, accepted the R&D version of the equipment from the contractor. This acceptance signalled the beginning of the ET/ST. There followed a two week indoctrination/orientation period for the benefit of the combined ET/ST team. Under this new concept of combined ET/ST testing, WSMR was designated the executive test agency with the Air Defense Board providing supporting personnel. This combined, or coordinated, test effort is scheduled to continue until September, 1969, when the team will split. WSMR will continue the remainder of the ET effort with the improved Hawk R&D equipment, while the Air Defense board with its Marine "allies" begins the temperate service test with the improved Hawk production prototype equipment. At the completion of the temperature service test in late November, 1969, two weeks of compatibility testing with MTDS are scheduled.

Although the temperate service test as currently scheduled will be concluded in mid-December, 1969, the improved Hawk system will still require more testing. Personnel from the Missile Test Branch, Air Defense Board, will have a continuing requirement to provide support throughout these remaining testing phases.

As an example, at the completion of the MTDS compatibility test, the improved Hawk system is scheduled to be shipped to Aberdeen, Maryland. Here, at the proving grounds, the system will undergo structural analysis testing of tie-down and lifting points, Munsen Road and slope adaptability tests up to 60 degrees. The Air Defense Board must provide sufficient personnel to insure that an operational improved Hawk system is available to the testing agency at all times. Board personnel will be required to ascertain and repair any damage which might be sustained during various stages of the tests.

From Aberdeen, the improved Hawk system is scheduled to be shipped to the U.S. Army General Equipment Test Activity (GETA), at Fort Lee, Virginia. Here it will undergo 15, 30 and 45 mph braking tests, tie-down and road transportability tests, rail humping at various speeds up to 10 mph, and Bern tunnel testing on both foreign and domestic flat cars. Then, still under the Executive direction of GETA, but at nearby Fort Story, Virginia, the system will be tested for logistics over the shore, or LOTS. Here the four Marines will be right at home! LOTS testing consists of beach loading and unloading from an LST, loading and unloading from an AKA, or APA, at sea into LCU, LCM-8, and LCM-6 smallboats, hitting the beach, subjecting the improved Hawk system to salt water spray and surf, and deep water fording and soft sand mobility tests.

Air transportability, to include both static and dynamic tie-down and flight tests, with Phase II Aircraft as well as helicoptor lifting are scheduled to be conducted at Langley Field, Virginia. The U.S. Army Airborne Electronics and Special Warfare Board from Fort Bragg, North Carolina, will be the executive test agency. Throughout all this testing, the Air Defense Board still must provide operational and maintenance support, before, during and after each test phase.

And it doesn't stop here. Operational testing in extreme environments at both the tropic test site, at Fort Clayton in the Panama Canal Zone, and at the Arctic Test Site, Fort Greely, Alaska, is also scheduled. At both of these test sites the improved Hawk system is scheduled to be placed in open storage for a limited period of time of about 75 to 90 days. It is felt that this type of limited open storage will more realistically simulate the type of treatment the system might encounter in a transcontinental move of a battalion under combat conditions. At the completion of each limited open storage period, the equipment will be set up, checked out, operated, tested and to complete both the tropic and arctic environmental test phases, a number of improved Hawk missiles are scheduled to be fired.

Barring time slippages caused by catastrophic system failures, delayed shipping schedules and/or untimely equipment deliveries, the improved Hawk missile system is presently scheduled to be involved in some form of test and evaluation until May, 1971. This time, plus the time already spent at testing to bring improved Hawk to its present functional status, represents a considerable expenditure in time, money, research and military and civilian manpower. Perhaps the next time you have a tendency to speak unkindly about the lack of performance or operation or the difficulty encountered trying to maintain whatever system or item of equipment you may be involved with, you'll remember that professional soldiers, perhaps Marines like yourself, are doing their best to provide you with as "military proof" and reliable equipment, when needed, as they are able. You may even find yourself in a similar position some day. I think they call it progress. US MC