

## History of Airlaunched Missiles



**B-52 Launching Hound Dog    Quail**  
**Hound Dog in Flight (AF Photos)**

### **Airlaunched Missiles** by Colonel (Ret) Charles G. Simpson, Executive Director, AAFM

#### **The Beginning**

At the end of World War II, the USAAF was working on a number of projects for air-to-air and air-to-surface missiles - many in conjunction with the new ground-launched systems and others based on WWII projects from both the allies and the enemy. In April, 1946, the airlaunched portion of the USAAF guided missile program consisted of a number of projects. Air-to-Surface projects included the MX-601, a Douglas Aircraft vertical bomb controlled in range and azimuth, called the Roc, the MX-674, a Bell Aircraft vertical bomb called the Tarzon, the MX-776, a Bell subsonic, 100 mile range subsonic missile called the Rascal, the MX-777, a McDonnell Aircraft 100 mile range supersonic missile, the MX-778, a Goodyear Aircraft 100 mile range subsonic missile, the MX-779, a Goodyear 100 mile range supersonic missile and the Mastiff, a 300 mile supersonic missile with an atomic warhead.

At the same time a number of Air-to-Air projects were programmed. These included the MX-570, a Hughes Aircraft 9 mile range, subsonic, 50,000 foot altitude JB-3, called Tiamat, the MX-798, a Hughes 5 mile range version of MX-570, the MX-799, a Ryan Aeronautical fighter-launched subsonic missile, called Firebird, the MX-800, a M. W. Kellogg fighter-launched supersonic missile, the MX-801, a Bendix Aviation fighter-launched supersonic missile and the MX-802, a General Electric bomber-launched supersonic missile, called Dragonfly.

*(continued page 4)*

## A Word from the Association

**National Meeting** - Our third national gathering is fast approaching - those who have registered are looking forward to a great time at Cocoa Beach. As we told you in the June issue, we will discuss the missile and space issue, review recently-law updates that bring us into conformance with changes in Colorado law and discuss our current programs. The board will also review the grant applications for the 1998 Missile Heritage Fund grants and will discuss plans for our next meeting, at Colorado Springs in the year 2000.

**321st Missile Group Closing** - a number of members attended the banquet and closing ceremony for the missile unit at Grand Forks. Our special color June issue made a big hit - copies were provided to all attendees. Our display was part of the decor in the three bay hangar where the banquet and ceremony were conducted. Some of the AAFM members present - John Darr, Sam Ruvolo, Bill Gavitt, Bob Safreno, Mike Shapiro, Rick Knoll, Bob Summers, Fred Crytzer, Terry Tobin, Warren Tobin, Charles Uhland, John Bodovinac, Moe Van Houten, Scott Mattson, Mike Jackson, Mike Emdin, Bill Lemieux, Jerry Drennan, Jerry Perryman and Don Cook.

**Newsletter Index** - an index of all articles for the com-

plete series of AAFM newsletters is available by mail or e-mail. Write, call or e-mail AAFM for your copy.

## Taps for Missileers -

Master Sergeant (Retired) Herb Vice, who was mentioned in the June issue in one of the articles, passed away. Herb served in the 569SMS and lived in Caldwell, Idaho.

## Letters to the Association

Address your letters to *AAFM*, Box 5693, Breckenridge, CO 80424, or send by e-mail to AFMISSILEERS@compuserve.com. Letters may be edited to fit - content/meaning will not be changed.

Dear AAFM - I received the December newsletter and the Member Directory - both are great! It is the first directory I have received, and I can see that much time and effort has gone into it. Being a retired enlisted Communications guy, I was hesitant in joining AAFM, believing I might be out of place. But quite the contrary, as I find most all articles and subjects interesting, and some I can relate to. After cross-training out of SAC aircraft, my missile field experience was 5 years at McConnell as a 465L SACCS maintenance technician, and QC evaluator/inspector. We then moved to Vandenberg for a very rewarding and enjoyable 3 years with the 3901st, before finishing with an assignment at HQ SAC.

Some of you old crew bears probably remember the TT-413 IBM input device (modified Selectric typewriter) used at the Titan ACPs (Minuteman, too). For us maintenance guys, they were a real mechanical nightmare (not to mention the TT-414 printer with the guillotine paper cutter.) I was definitely no expert on the 413, and tried to stay away from them. We did have a hot-shot TSgt though, that loved working on them. One night while on-call with this TSgt, we got a wake-up call to go to 3-9 because the 413 had quit working. We took a spare with us, and headed south out into the darkness. We got on the site okay, changed out the 413, but do you think it would work? Nope, it broke. Not to worry, said the TSgt, we'll just run back to the shop, fix it, and return to try it again. Well, 3-9 was no short trip, but off we went!

At the shop, the hot-shot replaced some critical parts that somehow broke after we had arrived on site, and an hour or so later, we were off to 3-9 again. We lugged the heavy thing down the stairs, through the blast

(continued page 3)

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**Letters** (cont) - doors again, and installed it. Sure enough, it was still not perfect, so time consuming adjustments had to be made. Bear in mind, we had completed a full day shift, and were now working well into the early AM hours of the following day. We weren't thinking too straight by then. As I got up from a crouched position, all of a sudden, I got VERY unbalanced and woozy, and thought I was going to hit the floor. It felt as if the whole level two was moving. I grabbed the racks and held on, thinking I would pass out any second. Then the laughter started.

Knowing we were really beat, one of the crew members had gone down to the lower level and jammed a big iron pipe between the wall and the platform. By pulling it back and forth, he had caused the whole capsule to rock. What a weird sensation. They're lucky I didn't lose it all over the deputy's console. It did ease the tension of getting the SACCS back on the air, which we did, and departed north again, for a few hours sleep before our day shift started. You crew guys had an interesting way of entertaining company!

If I might request just one addition to the directory, it would be to add a section of those of us that served with the 3901st. I firmly believe we were instrumental in keeping the force on alert, and in the best condition it could be, with sharp, well trained crew and technicians. As a Comm guy, I was proud to wear the missile badge. *MSgt (Ret) Stephen J. Kessler, Mbr No A1326, Detroit, Michigan*

Dear AAFM - When I was at Truax Field, Wisconsin in 1971, three young airman, (Airlaunch types) kept bringing up that wire net over drainage tiles leading from the missile storage area was rusted out and was a security problem. Work orders had been in at BCE for months, maybe a couple of years. One day, they walked into the back door of the NCOIC's home, laid their keys to the gate to the missile area on his table, did not say a word, turned and walked out. We took over security of the Missile area and kept things locked, after the Sgt of the Guard and the OD drove by one day and the guard was asleep. The three airmen had spent some time at the base hobby wood shop after work, cutting up some 2x2s into 1 foot lengths. Then painted them red and marked

them "Simulated Bomb" with a magic marker.

They kicked out the wire mesh, got in and entered one of two buildings, tossing the simulated bombs into storage bays, onto the roof, then hastily left. The NCOIC on duty spotted them, did not recognize them and called a "seven high". Of course the Security Police showed up and the three airmen gave themselves up because there were some very nervous sky cops. They were not searched and carried a couple of simulated bombs into the Security Police office.

Needless to say, there were some red faces - BCE, for not fixing what had been identified several times as a security problem, Security Police, as some members in the barracks did not turn out for the alert, and no one searched the "prisoners" and the NCOIC of the missile section who did not pick up the phone and call the OIC or Security Police for unusual actions by "his troops". The NCOIC was fired the next day, put in his retirement papers, and was immediately gone. The three airmen were transferred to Germany and Spain, and were gone as soon as they cleared base. One of the airman came back to Truax and finished out his 4 year enlistment after a two year tour in Germany. I became NCOIC when the Master Sergeant was fired, and the security problem was fixed the next day. *MSgt (Ret) Lee Higley, Mbr No A0531, Tacoma, Washington*

Dear AAFM - It seems we should have more members who had experience with the 392MTS and the 576MTS at VAFB. Are they all dead? At our last Reunion of our THOR Association, there were a lot of us there, but few show as members of AAFM.

Would it be practical in the Directory to include a Glossary of acronyms and a listing of the field locations?  
(continued page 10)

## Coming Events -

**AAFM National Meeting**, October 21-25, Cocoa Beach, Florida. Registration forms available from AAFM at 970-453-0500 or by e-mail (see box on page 2)

**44th Bomb Group Veterans Association/44SMW** - October 25-29, Savannah, Georgia. The original Ploesti Raiders welcome all missileer members of the 44th. AAFM will be there. Contact 44BGVA, PO Box 2367, Salt Lake City, UT 84110-2367.

**Air-launched Missiles (cont)** - Over the months following the April 1946 decision to pursue these projects, budget cuts, the emergence of a separate Air Force and interservice rivalry would all impact this list. Ground-launched systems were also being developed, and policy makers had to make some hard decisions as to the best use of limited resources.

By 1950, the USAF program had changed considerably from the original 1946 plan. The MX-674, or Bell Tarzon and the MX-776, or Bell Rascal I, to be followed by Rascal II with a 150 mile range were the only surviving air-to-air projects. Only one air-to-air project, the MX-904, or Hughes Falcon for fighters, to be followed by a bomber-launched version, survived.

By June of 1953, the missile program had evolved into a National Guided Missile Program. The only air-launched missiles under USAF development at that time were the Rascal and the Falcon. The Sparrow and Sidewinder were being developed, but by the Navy.

**The Missiles** - Unlike ground based missile systems that are developed for specific basing, most air-launched missiles have been used in a variety of ways on a variety of aircraft. Air-to-air missiles primarily are those used as weapons to down enemy aircraft. Air-to-surface missiles are used to destroy targets on the ground, and include short and long range systems. Some are designed for specific missions - the SRAM and the Hound Dog, for example, were nuclear armed strategic weapons. Others are designed to take out enemy radar systems, to penetrate hardened targets or other special purposes. Many air-launched missiles have been manufactured over long periods of time, by numerous manufacturers and in a variety of versions. Many have been used by the USAF, the Navy, Marine Corps and by the services of allied nations. This history does not include some of the current development and test projects that are ongoing, and we may have missed some - let us know.

### **Air-to-Air Missiles**

**Genie (MB-1, AIR-2)** - The Genie was a supersonic, unguided, free flight, air-to-air rocket designed to be carried and launched by interceptor aircraft from the Air Defense Command. The two kiloton nuclear warhead (W-25) was designed for use against formations of en-

emy bombers, and the system became operational in 1957.

Initially carried by the F-89J, and later by the F-101B and the F-106A, it was armed in the air a few minutes before firing. On 19 July 1957, a Genie was launched from an F-89J over the Nevada desert, marking the only time in history that an air-to-air rocket with a nuclear warhead was launched and detonated. The test took place at 20,000 feet, and the rocket was fired at a "target" about three miles away. The Genie covered this distance in 4.5 seconds and was detonated by ground command. Produced until 1962, it was in service until 1986.

Range was approximately 6 miles, speed about Mach 8, and it was 9 feet 7 inches long and 17 inches in diameter. It weighed about 800 pounds. The prime contractor for the was the Douglas Aircraft Company

The Genie's 40,000 pound thrust solid propellant rocket motor was manufactured by Aerojet-General. When a rail launcher was used, the initial impulse to fire the rocket motor came from the carrier aircraft through an umbilical cable to the igniter. If an ejection rack was used, the motor was not activated until after it was ejected from the aircraft. Electrically ignited gas cartridges moved a piston which imparted motion to the AIR-2 and causes its release. Tension on a lanyard attached to the aircraft and to the rocket motor initiator caused by the missile's descent actuated the initiator and then the lanyard broke at a designated point. The lanyard first activated a thermal battery which provided an electrical impulse to the motor igniter resulting in combustion of the

*(continued page 5)*

**Genie (AF Photo)**



**Air-launched Missiles (cont)** - solid propellant motor. The igniter was of the head end type, inserted when the AIR-2 was assembled.

Aircraft could carry one or two Genies, either on short pylons or internally. To raise the Genie to its position on the aircraft, a bomb lift trailer was used.

**Sidewinder (GAR-8, AIM-9A through AIM-9M)** - The AIM-9 is a close range, infrared guided missile designed to be fired from fighters against enemy aircraft, for both attack and defense. Developed in the 1950s, it continues in service today in many versions. The infrared system uses its target's heat for locating and tracking. A solid propellant motor accelerates the missile to speeds above Mach 2. Missiles are launched at distances measured from thousands of feet to more than 10 miles from the enemy aircraft. Launch may be made from off the line of flight of the target, and from above or below its flight altitude. Sidewinder was the first guided missile to down an enemy aircraft.

The AIM-9 was originally manufactured for the Navy, which designed and developed the it. A number of contractors have manufactured various versions. The Sidewinder has been carried on a wide variety of Air Force, Navy and NATO aircraft.

The missile body is a heavy aluminum tube, with a length of 9 feet, 5 inches, over-all span, 25 inches; body diameter, 5 inches, and weight up to 160.1 pounds.

**Falcon (GAR-1, 2, 3, 4 and 11, AIM-4A through G, AIM-26B, AIM-47A)** - Built primarily by the Hughes Aircraft Company but involving other contractors, Falcon was a family of air-to-air guided missiles.



**Falcon  
Variants  
(AF Photo)**

Development began in 1947 under the name project Dragonfly and it was first designated XF-98, a "pilotless interceptor." It was first tested in 1954 and became operational in 1955. Most versions were radar guided, and three versions ((C, D and G) were infrared guided. The AIM-4F and G were introduced simultaneously in 1960 to provide reduced susceptibility to enemy countermeasures and higher performance. The later version was the primary armament for F-106 but a number of aircraft carried the Falcon, including the F-89J, F-101, F-102, and F-4. The G versions were retired with the F-106 in 1988. The AIM-26 was a nuclear-armed version. Unlike the Genie, the nuclear Falcon was guided to a specific target, rather than a general area. The AIM-47A was never operational - it was planned for use on the F-12A (which became the SR-71).

The Falcon was powered by a Thiokol single or two stage solid propellant motor. Generally, it was 7 feet 2 inches long and a half inches in diameter and weighed 150 pounds. About 48,000 were manufactured.

**Sparrow (AIM 7- D through R)** - The Sparrows are guided missiles designed to be carried and fired from fighter planes against enemy aircraft. The Sparrow is a radar guided, all-weather, all-aspect capable missile. Manufactured by Raytheon and General Dynamics, more than 39,400 were produced. The various versions were developed to be carried by the F-4, F-111, F-104, F-14, F-15, F-16 and F-18.

Solid propellant motors are used for propulsion and to give the missile a speed above Mach 2. Missiles are launched at distances measured in thousands of feet to more than 25 miles from the enemy aircraft. The launch may be made from almost any angle off the line of flight of the enemy aircraft, and from above or below its flight altitude. The motors were manufactured by Aerojet and Rocketdyne. Missiles are 11 feet, 10 inches long, 8 inches in diameter, with a span of 3 feet, 4 inches and weigh 504 pounds. Range is 25 miles and speed is Mach 3.5.

Missiles are generally launched from ejection-type racks; however they may be launched from pylon-mounted launchers on aircraft so equipped.

**AMRAAM (AIM-120A and B)** - The Advanced Medium Air-to-air Missile was developed jointly

(continued page 6)

**Air-launched Missiles (cont)** - by the USAF and the Navy for use with the F-15, F-16, F-18, F-14, F-22 and NATO and allied fighters. The AIM-120 replaces the AIM-7 Sparrow, and is a medium range, look-down, shoot-down missile with fire-and-forget and multiple launch capabilities.

AMRAAM has inertial mid-course guidance and active radar terminal homing. The propulsion system was developed in 1979 by Alliant Techsystems, Hughes Aircraft and Raytheon. Testing was conducted in 1985 and 1986, and production began in 1987, with the first missile delivered in 1988. Total planned production is over 12,000 missiles. Propulsion is a boost-sustain propellant grain design solid motor with reduced smoke feature. The missile weighs 345 pounds, is 75 1/2 feet long, 7 inches in diameter and a span of 2 feet, 1 inch. The range is 30 miles and speed is mach 4.

### ***Air-to-Surface Missiles***

**Shrike (AGM-45A)** - The Shrike is a short-range missile used by tactical aircraft to locate and destroy radar transmitter stations. The missile contains a passive radar homing guidance unit capable of detecting radar transmissions and of guiding the missile to the transmission source. The missile is launched at the discretion of the aircraft commander after the aircraft enters the applicable delivery envelope. Missile range depends on aircraft launch altitude and delivery mode. The missile was developed at Naval Ordnance Test Station China Lake, California. The guidance and control contractor is Texas Instruments.

The solid propellant motor is manufactured by Rocketdyne Division of North American Aviation. It contains almost 92 pounds of propellant, adequate for only a short powered flight. The momentum achieved during this period and the pull of gravity provide the high velocity the missile reaches during the terminal part of its free flight. The missile is basically a cylinder which tapers to a point at the forward end. The assembled missile is 130 inches long, and has a body diameter of 8 inches. The overall span is approximately 36 inches. The total loaded weight is slightly more than 400 pounds.

**Quail (GAM-72, ADM-20)** - The Quail was a decoy missile carried by and launched from a B-52 bomber

to confuse or dilute a hostile radar-controlled air defense system. Each aircraft could carry four missiles. The Quail had a range of more than 200 miles at nearly sonic speed, after launch from its carrier. It was manufactured by McDonnell Aircraft Corporation.

It was powered by a General Electric J-58-GE-7 turbojet engine. The engine had an eight stage, axial flow compressor driven by a two stage turbine. Ethylene oxide was used for engine starting at extreme altitudes and fuel was JP-4 with Phillips 55MB additive. The additive prevented the formation of ice in the fuel at extremely low temperatures.

The missile airframe consisted of the forward body, aft body and wings. The forward body housed one of the offensive subsystems, the flight control system and the instrumentation system. It was a glass fiber laminate-honeycomb composite construction. The aft body, conventional aluminum construction, housed the engine, fuel and oil systems; air turbine alternator and another offensive subsystem. The wings were conventional aircraft-type construction, a short-span modified delta planform design. Missiles were carried in the aircraft with the wings folded. In this position, each was 29 inches wide and 26 inches high. In the wing extended position, the missile was 5 feet 5 inches wide, 12 feet 11 inches long and 3 feet 4 inches high. It weighed slightly under 2000 pounds.

Before launch, the four missiles were housed aboard the aircraft in two carriage racks in the bomb bay. The carriages were lowered, the missile wings extended, and the engine started automatically. An interlock circuit prevented the extension of the launch gear while the bomb bay doors were closed. After launch, the lower carriages were jettisoned. Normally the upper carriages were retracted. If the missiles were not launched, they were retracted into the aircraft after the wings were re-folded. If a launch gear failure prevented release or retraction of the missiles, thereby endangering the aircraft, the entire launch gear could be jettisoned. A fully extended missile would not clear the runway, if the bomber had to land with the launch gear down. Missiles were loaded into the aircraft by either the quick-load missile package method or the single-missile sequence loading method. In the quick-load method, a package consisting

(continued page 7)

**Air launched Missiles (cont)** - of four missiles and the supporting launch gear components was built up in the maintenance area, and then loaded into the carrier aircraft as a unit. The sequential method consisted of loading a single missile onto a launch gear carriage which was already installed in the aircraft.

**Hound Dog (GAM-77, AGM-28A, B)** - The North American Aviation Hound Dog was designed originally for a short three-year life span as a standoff weapon for the B-52. The missile was to have been replaced by the Skybolt air launched ballistic missile, but the Skybolt program was canceled in 1962. The missile would stay in service over 15 years before it was replaced by newer weapons like SRAM and ALCM. North American was awarded the contract to build Hound Dog in August 1957, and they relied heavily on work done on the Navaho intercontinental cruise missile.

The first powered flight occurred in April 1959, the first guided flight in October and the Air Force accepted the first production missile in December of that year. Over the next three and a half years, North American produced 722 missiles for SAC.

The missile was 42 feet 56 inches long, with a wing span of 12 feet. It weighed 12,000 pounds fully fueled with its single warhead, and was powered by a Pratt Whitney J-52 turbojet engine. North American's Autonetics Division developed the inertial guidance system in conjunction with a star tracker. One missile hung under each wing of a B-52 between the fuselage and the inboard engines. The missile had a range of about 700

#### **Bullpup and F-100 (AF Photo)**



miles, flew at Mach 2 plus and could evade enemy defenses by flying turns or doglegs to its target.

SAC activated Airborne Missile Maintenance Squadrons in 1962 at each of the B-52 bases to provide the maintenance for the Hound Dog and its sister decoy missile, the Quail. These units had between 77 and 90 officers and airmen who had previously been assigned to Armament and Electronics Maintenance Squadrons.

During its service life, Hound Dogs were deployed at twenty seven bases. A total of 295 B-52 bombers were configured to carry the missile during its lifetime. In 1972, SAC began deploying the Short Range Attack Missile (SRAM), and began phasing out the Hound Dog. The last missile left service in June 1975.

**Bullpup (GAM-83A, AGM-12A - E)** - The Bullpup was developed after Korea to fill the need for a high-performance, guided missile to match the capabilities of the new supersonic delivery aircraft. Built by Martin Orlando, Bullpup was originally developed for the Navy and came in three versions, AGM-12B (11 feet long and 571 pounds), AGM-12C (13.6 feet long and 1785 pounds) and AGM-12D and E (similar in size to the C). The B, C and E models carried conventional warheads and the D model was designed for use with a nuclear warhead. Range varied from 3 to 6 miles and propulsion was by prepackaged liquid rocket, although the original design used a solid motor. The missiles were radio guided by the launching aircraft. The missiles were carried by the F-100 and F-105.

The missiles were extremely accurate and reliable, designed for use against airfields, trains, truck convoys, bridges and other targets. Tracking flares in the tail allowed the pilot who launched the Bullpup to follow the missile visually while sending commands to guide the missile to the target. Bullpups were designed to be treated like a "round of ammunition", so no pre-firing checkout was required and the missile could be loaded in about five minutes using standard bomb-handling equipment.

**Skybolt (GAM-87A)** - Designed to be a complement and then a replacement for the Hound Dog, the Skybolt was a nuclear deterrent weapon planned to be carried by the B-52 and the British Vulcan bomber. The two stage, solid motor, inertially guided air launched bal

(continued page 8)



Mavericks being loaded (Af Photo)

**Airlaunched Missiles (cont)** - istic missile (ALBM) was built by Douglas Aircraft, and was first launched on April 19, 1962. The first launch was a partial success, because the second stage failed to ignite.

The Skybolt had a range of 1,150 miles, was 33 feet long, 3 feet in diameter and weighted 11,000 pounds. A B-52 could carry up to four of the missiles, in addition to an internal bomb load. Secretary of Defense McNamara canceled the Skybolt in the early 1960s.

**Maverick (AGM-65A through G)** - A tactical, rocket powered missile similar to the unpowered Walleye AGM-26A glide bomb, the Maverick uses launch and leave television guidance on early models or infrared guidance systems later, initially controlled by the aircraft crew, and was designed originally for the A-7, F-4 and F-111, and later used on the A-10, F-16 and F-15. Hughes Aircraft built the Maverick, designed to be used against pinpoint targets, tanks and truck convoys. Over 100 Mavericks were used per day during the Gulf War.

More than 25,000 Mavericks were manufactured. The missile has a solid rocket motor, is 8 feet, 2 inches long, 1 foot in diameter, a wingspan of 2 feet, 4 1/2 inches and weighs up to 662 pounds. Range is up to 14 miles.

**HARM (AGM-88A through C)** - The High Speed Antiradiation Missile (HARM) was developed as a follow-on to the Shrike to destroy enemy radar sites and systems. Proven in the Gulf War and used on the F-16 and F-15E, the HARM was built by Texas Instruments and powered by a Thiokol solid propellant motor. The passive homing guidance system homes in on enemy radar emissions. More than 10,000 HARMs have been de-

livered to the USAF and the Navy.

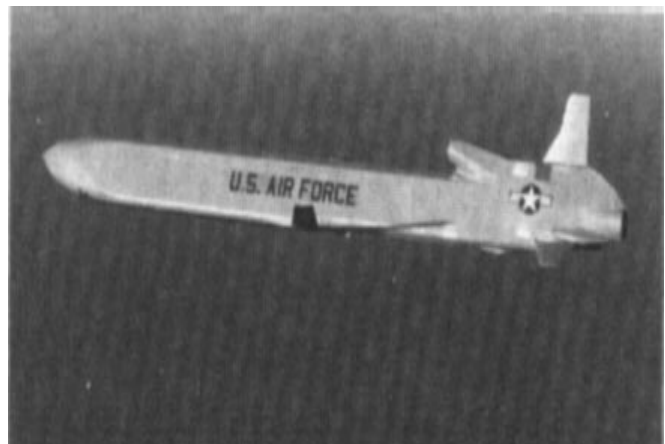
The missile is 13 feet, 8 1/2 inches long, 10 inches in diameter, has a wingspan of 3 feet, 8 1/2 inches and weighs 807 pounds. Its range is more than 10 miles.

**Standard (AGM-78A - D)** The Standard ARM (Anti-Radiation Missile) entered production in 1968 and provided a significant increase in capabilities in countering the threat of radar-controlled anti-aircraft missiles and guns. Initially using the Shrike target-seeker, later versions used improved seeker heads and avionics for increased effectiveness against countermeasures. Built by General Dynamics, the Standard ARM was used on the F-4G, F-105 and Navy aircraft.

Powered by a Rocketdyne solid propellant motor, it was 9 feet 5 inches long, 5 inches in diameter, had a span of 2 feet and a range up to 11 miles.

**Harpoon (AGM-84A)** - The Harpoon, a Navy all-weather antiship cruise missile, was adapted in 1983 to be carried by the B-52G to support maritime antisurface warfare operations. Each B-52G could carry eight missiles. When the use of the Harpoon was proposed, the USAF planned to equip B-52H models when the G models retired. The Harpoon uses sea-skimming cruise guidance monitored by a radar altimeter and active radar homing. The McDonnell Douglas missile is powered by a Teledyne turbojet engine, weighs 1145 pounds, is 12 feet, 7 inches long, a little over 1 foot in diameter and has a wing span of 3 feet.

ALCM in Flight (AF Photo)



(continued page 9)

**Air-launched Missiles (cont) - ALCM (AGM-86B and C)** - Originally designed for use with a nuclear warhead, the ALCM, built by Boeing, currently arm B-52H aircraft, with 12 missiles carried externally and 8 in an internal rotary launcher. The ALCM was procured as a precision attack weapon that is accurate and highly survivable, and could be fired over 1,500 miles from its target. A total of 1,715 missiles were produced, and the C model was designed for use with a conventional warhead and uses GPS to enhance the inertial/TERCOM guidance. The conventional model was used in the Gulf War.

The 3,200 pound ALCM is powered by a Williams or Teledyn turbofan engine, is 20 feet, 9 inches long, 2 feet in diameter and has a wingspan of 12 feet.

**ACM (AGM-129A)** - The Advanced Cruise Missile (ACM) is deployed on the B-52H and is a low observable cruise missile with improved capabilities when compared to the ALCM. Developed by General Dynamics, with McDonnell Douglas selected as a second source, the first ACM was delivered in August 1993. A total of 461 missiles were ordered.

Powered by a Williams turbofan and using inertial guidance with a TERCOM update, the ACM was designed for a nuclear warhead. Range is 1,865 miles, and the missile is 20 feet, 10 inches long, 2 feet 3 3/4 inches wide and has wingspan of 10 feet, 2 inches.

**Have Nap (AGM-142)** - Based on the Israeli Popeye, the Have Nap is a medium range standoff weapon designed to provide precision strike capability. It has been recently launched from the B-52H in tests against land and sea targets. Built by Rafael and Martin Marietta, it is 18 feet 8 inches long, 1 foot 8 inches in diameter and has a 5 foot 1 inch wing span, with a range of 50 miles.

Sources: 1966 Aerospace Year Book, published by AIA, Inc.

Various Air Force Magazine Almanac and Aviation Week special issues

The Air Officers Guide, 1962, The Military Service Publishing Co. Jacob Neufeld, Ballistic Missiles in the USAF, 1945-1960, Office of Air Force History

AFR 127-101, 10 March 1967

CMSgt (Retired) Walter Kundis, AAFM Member Number A0640, who lives in Mililani Town, Hawaii. Chief Kundis served in PT boats in WWII, on Titan II crew at Little Rock, and as PACAF's Missile Chief before retiring.

**Drones in Arizona** - by Jim Gasho, member number A0067. Jim lives in Reno, Nevada

My first assignment as a Second Lieutenant was the 4750th Drone Squadron, Vincent AFB, outside of Yuma Arizona (now a Marine facility). In 1958 there were two Air Force bases that had Q-2A drone squadrons. One was Tyndall AFB in Florida and the other was Vincent AFB. I reported to Vincent in March 1958 as a missile maintenance officer. The mission of the base was to give TDY fighter squadrons training in firing 2.75 inch rocket at Delmar targets towed by B57s. From time to time the drones were used as targets, but usually only visiting VIP's got the opportunity to fire at one.

The base also had a squadron that was air launching Ryan Firebee Q-2A drones where I was assigned. The drones were launched using modified B-26s. Recovery from the Yuma desert was in most cases H-21 helicopters. The B-26s had a bomb rack installed under each wing to carry the drones. Although two drones were carried aloft, only one drone was launched since the ground station could only control a single drone at a time. The drones could be released either electrically or if that failed there was a mechanical lanyard that could be pulled. Once airborne the drones were checked out and "launched" by a missile maintenance NCO. He sat in a small compartment in the tail section of the aircraft. Two windows were installed in the fuselage so he could observe each of the drones. When the aircraft reached 10,000 feet, he would commence a preflight checklist to see if the control surfaces were functioning properly. Until the drone's jet engine was started, the drone received its electrical power via an umbilical cord from the aircraft. An additional part of the pre-flight check was to have the pilot climb and dive the aircraft to see if the drones control surfaces responded properly. If everything checked out, the drone's jet was started and upon a signal from the ground station, the drone was dropped.

The ground station on the base, was a MSQ-1 radar. It would track and provide commands to the drone during the 45 to 60 minute flight. To terminate the mission, the ground control station would shut down the jet engine. A parachute would deploy and the drone would eventually land on the desert floor. A quick release mechanism uncoupled the parachute from the drone so it

*(continued page 11)*

**Letters** (cont) - tions of the various training and operational missile and associated squadrons, and the time periods there? I suggest these things since the current format and tone of the Directory is more like that of a statistical abstract, understandable only by missileers who haven't forgotten yet what those terms, acronyms, and numbers mean.

To me, the Directory should be more of a historical document, something my descendants could read, and understand where Grandpa fit into the big picture. Your inclusion of historical articles by members is great, and partly accomplishes what I am suggesting. *LtCol (Ret) Gordon S. Adams, Mbr No A0422, Sunnyvale, California*

***We'll add a glossary and other information in future directories - I just forgot to put it in the last one. As to listing specific units (like the 3901SMES), there are just too many to list them all - but will look at ways identify some of them. Remember we can provide lists to members at any time for specific units or systems. Your Executive Director***

Dear AAFM - I am an ex-Missileer from the 585th Tactical Missile Group (USAFE). I was both a member of the 585th Communications & Guidance Squadron and also the 71st Tactical Missile Squadron. They were both under the 585th TMG, 38th Tactical Missile Wing. Our base was Bitburg, Germany. Our weapon was the TM61 Martin Matador, a tactical, launch in all weather missile. I was "rotated" back to the States in August, 1961.

I read with interest your post about the Missile Badge. We were some of the first missile folks to be awarded that badge. I have a copy of the Missileer from October 1959. It is Volume 2 Number 9. I thought you might be interested in an article that it contained. The Missileer was the official magazine of the 38th TMW. An article from that issue is summarized below:

Program for the Dedication of the "Missile Insignia and Plaque" Bitburg Air base, Germany - October 30, 1959 The idea, which eventually led to the "Missile Insignia and Plaque, originated among the men of the 71st Tactical Missile Squadron during "Operation Marblehead," the 1958 AMLO (annual missile launch operation) at Wheelus Air Base, Libya.

Instead of the usual "blast-back-home" party, the men elected to pool their resources for the casting of a large replica of the new Guided Missile Insignia which was then being worn for the first time by USAF missilemen. Material for the casting was to come from the remnants of the missiles which these crews had fired and which had been salvaged from the desert target area.

After considerable trial and error, and with help from many sides, a nine-foot-high solid aluminum replica of the Missile Insignia was final cast by a firm in Trier, Germany. *Harry Bosch, Grants Pass, Oregon*  
***We featured the monument in two of our early issues. Sadly, the Bitburg monument has disappeared.***

Dear AAFM - I have a very strong interest in the Thor IRBM system as placed in the UK between 1958 and 1963, and I wonder if any of your members would care to correspond with me about the system. One base was very near my home and I still have vivid memories of seeing the Thors erect and being refueled. I realise that your site is probably not meant to be used for such requests, and hope you will forgive my being so forward in my search for information. *Geoff Goodchild, Elm Lodge, 26 Spencer Street, Ringstead, Northamptonshire, NN14 4BX, England.*

Dear AAFM - I served as a launch control officer in the 446SMS and the 447SMS (321SMW) in the late 60's and find somewhat of a nostalgic twinge to see the old unit dissolve. When I was at Grand Forks the 321SMW was commanded by Colonel Gerald Fall, somewhat of a "tough guy" as commander of our unit. This was at the same time that the Vietnam War was at its height, and tensions were very high about that conflict.

There was a backlash activity in the military when Admiral Zumwalt made a statement in a Sunday magazine, "I can't speak for all of the American military, but I can assure you that all Navy officers are in favor of the war in Vietnam." Several Navy officers made a public statement which conflicted with that of their superior officer. Other officers in the other services followed suit and founded the Concerned Officers Movement. Those of us who belonged to COM were highly motivated mili-

(continued page 11)

**Letters** (cont) - tary officers, but we objected to the notion that we were in favor of the Vietnam War because our commander said we were.

It was the opinion of the military that officers were not allowed to have a public opinion about their jobs.... no matter how well they did them. As a result, COM members were subjected to Office of Special Investigation investigations and a variety of intimidating activities. I had to see Colonel Fall once a week to explain why a “good officer like you is against the war.” I would explain that “The war is a disaster the way we’re fighting it. Let’s stop fooling around and win it or get out.” Colonel Fall would agree with me each week, but insist that it was improper for an officer to have a public opinion in these matters. *Royal Barnard, Mbr No A1191, Rutland, Vermont*

**Drones in Arizona** (cont) - would not be dragged over the desert in the event of windy conditions. An H-21 helicopter would be dispatched to retrieve the drone, parachute and tail cone that held the parachute was housed. When a helicopter was not available or when the temperature was so high that the chopper was unable to lift the drone, a flatbed truck and a crane would be sent into the desert to retrieve the drone. Upon returning to the base, the drone would be dismantled. The electronics would go in for a bench test, the engine was serviced and ground tested and any damage to the airframe from the landing would be repaired.

Our squadron had a Ryan factory representative working with us at all times. Results of flight were communicated to San Diego and new ideas or modified equipment would be delivered to us for testing. Wing pods were installed on some drones so that a camera could be inserted to photograph in-coming rockets from the 90 degree angle. (Too bad we didn’t have the foresight to install the camera pointing down to the ground). In another instance a red flashing beacon was installed on top of the drone’s fuselage. A night mission was flown so that observers on the ground could track the flight/position of the drone. A kerosene fuel tank was installed in another drone with a metal tube positioned so that the kerosene, on a command from the ground station, could be released into the jet’s exhaust. Again this could be observed from the ground to locate the drone’s position.

Before the base was turned over to the Marines in 1959, our squadron (personnel, aircraft and drones) joined forces with the squadron at Tyndall for the William Tell meet held there. I was reassigned in March 1959.

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Thor in the village of Weldon (AF Photo)

**ANOTHER TIME REVISITED** - by  
Tom Hafner, member number A0291. Tom lives in Belleair  
Beach, Florida.

After almost 37 years, I had the opportunity to go back in time, and visit the base where I was an Authentication Officer on the Thor missile in England. After that length of time, one would expect that the base would be in a shambles, and buildings torn down, or in terrible condition. Not so at RAF Hemswell, 12 miles north of Lincoln, in Lincolnshire, England. When the Thor left, the base was deactivated and turned into a staging area for a variety of causes. In one case, it was a training base for Middle Eastern nationals, and a variety of uses. Part of the base was, and still is quarters for active duty RAF people stationed at RAF Scampton.

After renting a car at Heathrow, and terrorizing the UK drivers, we arrived at Hemswell. I had seen in a brochure on accommodations in Lincolnshire that the RAF Officer's Mess had become a bed and breakfast. I made reservations and started on a nostalgic trip back in time.

Not only was the base intact, but the GI housing in RAF Sturgate as well. Also, time had virtually stood still. Almost everything from Gainesboro to Lincoln had had very little change. The roads were the same, the people, stores, facilities, and the great fish and chips were the same as in 1962.

Some things had changed. There was a supermarket in Gainesboro, and there were up to date roads going through Lincoln. However, for those of you that had participated, the Green Dragon Pub was still in full swing, but alas, Caineby Corner hotel was empty, but still there.

Hemswell, is now the Hemswell Antique Center, and although a little dilapidated, all of the buildings are still standing. The Orderly Room, the hanger that housed our command post, the guard room, headquarters were there, and the field that had the missile site was overgrown with canola oil plants. Sturgate is a private airfield. The 699 Club is gone, but the Rose and Crown Pub and the Fish and Chips shop are still going strong.

The Officer's mess had been renovated into flats, and the north section was an elegant bed and breakfast facility. Naturally, since the owner of the antique center was the operator of the B&B, the building was filled with antiques. The rooms had been converted into luxurious suites, and the public areas into a beautiful living room, sitting area, and a wonderful dining room.

The Anti Room where so many "Games" were played, and the dining room where so many toasts were used for weddings and receptions. The only down side was the fact that the well used bar, was now a store room. The owners were very gracious, and we enjoyed an elegant happy hour, and a delicious English meal - candles, Port; the works. We were the first Americans that had ever been back, and there were many questions about what we were really doing there in the early 60s.

It isn't often that anyone can return to a spot after 37 years and experience little change. There were many ghosts in that mess. The good times we had - the mission we performed - somehow, I could hear the clinking pints during the "Schooner Races" and the roar of the crowd during the Card Rugby game. It was a real experience. (If you were with the Thor at RAF Hemswell and want to visit, Tom will be glad to provide information. Contact him through AAFM.)

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