



# Fist of the Fleet Association

a non profit 501 (c) (19) military organization

## NEWSLETTER

April 2015

Preserving the Past Providing for Today

Promoting the Future

### SPRING EDITION

For those of you who pay attention to the ramblings and rumblings of lunatics another new movement has begun to undermine the overall ability of our military forces to respond to threats, real and perceived, across the globe. Certain former officers of the United States Navy are again calling for the elimination of the aircraft carrier. In the following article my comments are in parenthesis. Writing in the National Review, retired Navy Capt. Jerry Hendrix makes the case that aircraft carriers are simply not suited to the future of naval warfare. Instead, Hendrix believes that carriers have simply become so valuable that the Navy as a whole could not stand losing one. "At \$14 billion apiece, one of them can cost the equivalent of nearly an entire year's shipbuilding budget," Hendrix notes. (So stop building crappy little boats like the LCS) "Each carrier holds the population of a small town. Americans are willing to risk their lives for important reasons, but they have also become increasingly averse to casualties." (*Everyone* is averse to casualties, but politicians more so as it impedes their chances for reelection) (PS: Ship building? *Very* good for reelection).

A single aircraft carrier today can be thought of as more like a small self-contained floating military base than an actual naval vessel. A Nimitz-class supercarrier can carry around 5,000 people onboard while having its own functioning internal economy. The loss of a single carrier could conceivably lead to about twice as many US fatalities as in the entirety of the war in Afghanistan. (Only the insane would try to penetrate the Task Force to strike a carrier; but then most of our enemies are insane) The obvious value of a carrier would make it a prime target for an enemy strike. (The odds of actually sinking a carrier are negligible, and *all* vessels afloat are targets) Since World War II, the US has had relatively free access to the world's sea lanes. But the US is facing increasingly hostile maritime forces with China positioning itself as the naval hegemon in the Pacific. (China is building a carrier task group, and see previous Newsletters for the state of carrier developments and deployments world-wide, and doesn't he sound just a bit too paranoid?)

Beijing has also invested heavily in anti-ship cruise missiles (Who hasn't?), and submarines capable of launching these missiles, (Ditto) that could target US aircraft carriers while evading the US Navy's Aegis Defense System. The existence of China's anti-ship weapons program, which has been designed especially to counter US influence, makes the specific value of carriers questionable and forces the US to make some very uncomfortable choices. Either the US can refrain from positioning its carriers within strike of Chinese military assets, ceding influence, or it could hypothetically risk the lives of thousands of Americans by placing a carrier within range of Chinese assets. (You don't win conflicts by sitting outside the zone of influence. By the way, we could knock *most* of those missiles down.....*Is* China a threat?.....Maybe).

"For this reason, the modern carrier violates a core principle of war: Never introduce an element that you cannot afford to lose," Hendrix writes. (*Who's defeatist principle is that? All* elements and assets are valuable! But he who does not risk, cannot win.) And that, in Hendrix's mind, is the main problem with the aircraft-carrier program. Carriers, although larger and more technically impressive than ever, are systems designed in a different age to deal with a different historical context, a time when states fought major naval engagements while operating at a comparable technological and operational level (Not true, we were way ahead). "Today's Navy looks remarkably like it has for the past 70 years, just smaller and more expensive," Hendrix notes. "It is an evolutionary force, not a revolutionary force, and it's an easy target for rising powers that seek to overtake it."

I found this article dated 4/24/15 by James Bender the other day, and I've seen others like it in the past. There is another article I found in the Navy Times that's just as disturbing, and it's by the SecNav Ray Mabus. Mabus wants to have the F-35 be the last *manned* carrier aircraft, and foresees a time when all aircraft are drones. Really? I have a better idea. It's easier, cheaper and will save a ton of time. Just run up the white flag.

#### Mission Statement

**Perpetuate the history of Naval Aviation Squadrons VT-17, VA-6B, VA-65, VA-25 and VFA-25,  
Remember deceased veterans and comfort their survivors,  
Conduct charitable and educational programs,  
Foster and participate in activities of patriotic nature,  
Assist current active squadron members, and  
Provide assistance to family members in times of emergency.**

## President's Message

Work continues in preparation for F15 in DFW. Our FOFA website has been updated and there is a link on the Reunion page that takes you to the Embassy Suites reservations site for our block of rooms. Make your reservations early since this is a busy time of year for the hotel. As of this writing 35 rooms of our block of 50 have been reserved. Bob Schreiber, F15 web-master, has created a list of attendees on the F15 Registration page under the Reunion page where you can check to see who is scheduled to attend. This is where you can also register to attend F15. You can download and print the mail-in registration form at the bottom to pay by check or use the online PayPal selections. **A caution when using the PayPal buttons**. After you have made your selections and go to checkout, make sure you cross check the quantities in each box. Sometimes the correct number is not transferring to the checkout page. You can easily change the number desired and hit update on the checkout page before your purchase. Sorry for the inconvenience and confusion.

Regarding our planned tour of the Lockheed/Martin F-35 assembly plant, I have been informed by their management that they can only accept 75 guests for the tour on Friday October 30<sup>th</sup>. I am trying to negotiate a little more flexibility from them, but we will have to wait and see. I am not happy about this to say the least, but it is what it is. Right now, the first 75 signed up get to go. We can look at an alternate tour like the George W. Bush Presidential Library if a group is interested. Let me know your thoughts.

The process of filing with the IRS for reinstatement of our tax-exempt status is finally reaching completion and will be submitted in early May. It has taken much longer than expected and was a tedious, to say the least, project. I want to sincerely thank Chuck Webster, FOFA Treasurer, for his superb efforts supplying me with the necessary data on many phone calls so we could get this compiled and submitted. We both learned a lot and will ensure this does not happen again in the future. I do not know how long it will be before we get a reply from IRS concerning reinstatement. We will let the membership know as soon as we get further info.

We have also kicked off the project of redesign of our website. Bob Schreiber and I participated in a conference call with Julie Chalker to begin this process. Julie will be forwarding a proposed sample page with the new design theme for our consideration soon. After approval the new website will go into development and hopefully could be tested and set up live later this summer.

On a sad note we were just informed of the passing of CDR Edward V. Izac, Jr. former CO of VA-65 in 1958. He died on April 18, 2014 and is buried in Fort Rosecrans National Military Cemetery in San Diego. I just received notice also of the passing of Mary Greathouse wife of Skipper Ed Greathouse VA-25 on 23 April. We extend our sincere sympathy to both families.

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A-4 Skyhawks flown by the USN Blue Angels  
National Parachute Test Range, winter home of the Blue Angels, El Centro, California, circa 1976.

## Blue Angels Tour Dates

May 2/3 Barksdale AFB LA  
16/17 Westover ARB MA  
23/24 Rochester NY

Jun 6/7 Rockford IL J  
30/21 Latrobe PA

Jul 4/5 Eau Claire WI  
18/19 Hillsboro OR

9/10 Davenport IA  
20/22 UNSA MD  
30/31 North Kingstown RI

13/14 Ocean City MD  
27/28 Evansville IN

Pensacola Beach FL  
25/26 Fargo ND

## SKIPPER'S CORNER

FIST of the FLEET,

I am happy to report that the squadron has not taken its foot off of the gas pedal since the winter newsletter. We are currently at NAS Fallon executing the Air to Surface Strike/Fighter Advanced Readiness Program (SFARP). While a building block approach is used, the tactical learning curve is incredibly steep. I am amazed every day by the caliber of our Sailors and officers. It truly is the finest group of men and women I've ever served with. Whether maintenance, administration, or operations, this is truly a team effort. Every member of this phenomenal squadron is excelling and the future is bright for our team and exceptionally dim for the enemy. The year will continue with a very aggressive work up schedule leading to an eventual deployment. When the squadron finally leaves it will do so with roughly 120 Sailors and officers that have never deployed. That is a fairly staggering statistic when you consider our manning complement is only 190 personnel. I have all the confidence that they will perform with the skill, precision, and efficiency of the most seasoned of commands.



Sadly, this will be the last Skipper's Corner that I author. On May 22<sup>nd</sup> I will turn over leadership of this amazing squadron to CDR Chad 'Decaf' Gerber. He is a fantastic officer and will take the Fist of the Fleet to new heights. It's been my honor and privilege to serve as the 67<sup>th</sup> commanding officer of VFA-25. The support by the FOFA is unlike anything I've witnessed in my career and I look forward to many years of camaraderie as a fellow alumnus. Thank you for all that you do for our Sailors!

Very respectfully,  
FIST One

## FROM THE COCKPIT

By: LT Justin "Neuman" Reece

Strike Fighter Squadron TWO FIVE continues to prepare for our upcoming deployment executing a busy schedule at home and on the road. Since February when we completed the air-to-air portion of the Strike Fighter Advanced Readiness Program (SFARP), we shifted gears to air-to-surface execution and are now on a Fallon detachment. The work-ups cycle with CVW-7 has provided many training and readiness opportunities for both pilots and maintenance professionals.

From operations in the air to administration on the ground, the *Fist of the Fleet* is excelling at every turn. The squadron was awarded the Medical Blue "M" for superior medical and dental readiness among all 195 Sailors assigned. Awards such as this demonstrate the entire command's commitment to taking care of each other and working hard each and every day to ensure our Sailors are fit to perform any and all tasking required for the mission. Since joining the eight squadron air wing comprising CVW-7, VFA-25 has consistently enjoyed the highest personnel readiness rates.

Team Fist also surpassed the CNO's enlisted retention goals for 2014 resulting in the Retention Excellence Award for the third year in a row! From the newest Airman to the Commanding Officer, every member of the squadron shares the unique challenges and opportunities associated with military service. Here in VFA-25, every Sailor has a voice in our team-oriented culture leading to a healthy work-life balance conducive to productivity and fostering career-minded professionals. Pride and professionalism carries the day.

From an operational perspective, VFA-25 excelled in several warfare areas resulting in a significant boost to our operational effectiveness. For our outstanding performance in air-to-surface employment, the squadron was crowned the 2014 Bombing Derby champions by Strike Fighter Weapons School, Pacific (SFWSP). This award is reserved for the NAS Lemoore squadron receiving the most points during three evaluated bombing events. Grading criteria included mission planning, precise timing, division target area tactics, and weapons employment accuracy. In each of the graded events squadron pilots employed with lethal precision and timing resulting in a clean sweep of the competition.

As every strike fighter squadron knows, being good in air-to-surface is only half the necessary skill-set; it is also essential to be lethal in the air-to-air arena. As a result of the entire squadron's superior performance during last year's missile shoot in Tyndall AFB, VFA-25 received the Commander, Naval Air Forces, US Pacific Fleet, Boola Boola award. This award is given to the squadron that performs the best from maintenance to operations and ultimately in-flight weapons employment. Every member of Team Fist was instrumental in the success of the five missile shoot and significantly enhanced our overall training and readiness.

On April 16 we had the distinct honor to welcome two retired Admirals into our Lemoore squadron spaces. Vice Admiral (Ret.) John "Spider" Lockard was the Commanding Officer of VA-25 from July 1980 to October 1981 flying the A-7 Corsair II. He walked our entire hangar from one side to the other meeting the vast majority of our Sailors and thanking them for their service.

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### Have you paid your 2015 Dues?

Annual Dues: \$25/YR

Life Time Dues \$200

Mail dues to Financial Officer:

Chuck Webster 39224 132nd St. Bath SD 57427

### Only Voting Members receive a copy of the Directory

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Visit the Base Exchange at

[www.fistofthefleet.org](http://www.fistofthefleet.org)

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Additionally, he shared sea stories from his tenure as FIST ONE to our junior officers as if passing the torch to the next generation of *Fisties*. VADM Lockard was joined by Vice Admiral (Ret.) Cutler Dawson on his visit. VADM Dawson served more than 34 years in the Navy both ashore and afloat including tours as Commander, Second Fleet and as the Navy's Chief of Legislative Affairs. His current position is as President and Chief Executive Officer of Navy Federal Credit Union, the largest credit union the world has ever known. It was truly an honor to have these amazing veterans visit our squadron, impart their wisdom, and show us what a lifetime of service really means.

As this newsletter is being released, VFA-25 is on detachment to NAS Fallon to complete air-to-surface SFARP. Fully integrated now into CVW-7, the squadron continues to demonstrate what it means to be a professional in everything you do. NAS Fallon offers many opportunities to perfect our trade to ensure our success on the battlefield where it matters most. As many of FOFA members can attest, Fallon is the one place where all of our skills, capabilities, aircraft, and maintainers can be put to the test in as close a combat scenario as possible. Without a doubt, the squadron will continue to achieve new heights of excellence both in the air and on the ground. When called upon, VFA-25 will execute our nation's business wherever, and whenever, needed.



CDR Gerber, VADM (Ret.) Dawson, VADM (Ret.) Lockard, CDR Snowden



Aircraft 400 Executing Low Level Tactics



Fist Sailors Prepare To Launch Aircraft



By :Jeff Baconon Navy Times April 13, 2015



Ordnancemen Prepare Aircraft for Launch

## **FIST OF THE FLEET ASSOCIATION NEWS**

New Life Member

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**FROM THE HANGAR DECK WILL RETURN NEXT ISSUE**

# Departure Notification

Commander Edouard Victor Izac, Jr, USN Retired

Born: 09/19/1919 Died: 04/18/2014



15 May 1958 CDR Edouard V. Izac, Jr. relieved CDR W. C. Bates as Commanding Officer; VA-65. During his tenure VA-65 made the 1958 WestPac aboard the *Midway*. CDR Izac saw duty during WWII and eventually served on the carriers *Essex*, *Leyte*, and then twice on the *F D Roosevelt*. His daughter Suzette Marie Izac continued his family tradition of service to country retiring from the USAF as a Major.

CDR Izac, Jr. was the son of Edouard Victor Michel Izac who, as a US Navy Lieutenant on 31 May 1918, was aboard the troopship *President Lincoln* when she sank after being struck by three torpedoes from the German submarine *U-90*. Izac was taken aboard the *U-90* as a prisoner of war. Learning valuable information about enemy submarine movements on the trip to Germany, he tried to escape several times. On one attempt, he was injured after jumping through the window of a moving train. He finally succeeded in escaping, with several others, from a German prison camp on the night of 6-7 Oct. He and a Sub-Lieutenant Willis reached neutral Switzerland on 13 Oct. Upon reaching London, he passed on his information to Admiral Sims; by that time, however, the war was nearly over, and Sims showed little interest. Nevertheless, for his actions, he was awarded the Medal of Honor. He was forced to retire in 1921 on account of wounds received while a prisoner of war in Germany. His awards included the Croce di Guerra al Merito of Italy and the Cross of Montenegro. At the time of his death in 1990 at the age of 98 he was the last living Medal of Honor recipient from World War I.



CDR Izac VA-65 1958



VA-65 Circa 1958



Croce di Guerra al Merito



Edouard Victor Michel Izac



Cross of Montenegro



USS Essex, CV-9, 1943



Aviator Memorial; Naval Air Station Lemoore

## **DID YOU KNOW: NAVY, MILITARY AND OTHER INFORMATION**

The French carrier *Charles de Gaulle* (R91) has left the Persian Gulf after about two months of strike operations against ISIS. The carrier and its accompanying Task Force 473 are now bound for the Indian state of Goa for exercises with the Indian military. In its time in the region, the carrier launched an average of 10 to 15 sorties a day with its complement of about 20 strike aircraft. The strike missions and an unknown number of surveillance flights were in support of the U.S. led Operation Inherent Resolve missions. The departure of the carrier brings France's contribution to the anti-ISIS air effort down to six Rafales based in the UAE and six Dassault Mirage IIIs in Jordan. Task Force 473 — comprised of the 7,050 ton Forbin-class guided missile destroyer *Chevalier Paul* (D621) and at least one French nuclear attack submarine and a fleet oiler — left France in January shortly after the terrorism strike on the offices of French satirical magazine Charlie Hebdo. In remarks in Toulon on Jan. 14, French president François Hollande said the assault on the magazine, "justifies the presence of our aircraft carrier." France will still operate missions in support of OIR with strike aircraft based in Jordan and the United Arab Emirates.

The U.S. recently swapped its own carrier force in the region from the Carl Vinson carrier strike group (CSG) to the Theodore Roosevelt CSG. The *Charles de Gaulle*'s trip to India for the exercises in Goa are thought to buttress further French arms sales to the country. In a visit to France earlier this month by Indian Prime Minister Narendra Modi, India agreed to purchase 36 French Rafales in a deal that could be worth up to \$4.3 billion. The carrier group will arrive later this week to start the 10-day Varuna training that runs from April 23 to May 3.



USS Carl Vinson (CVN 70), left, and the French nuclear aircraft carrier Charles de Gaulle (R91) transit the Northern Arabian Gulf on March 8, 2015.



A French navy Rafale Marine aircraft from French navy nuclear-powered aircraft carrier Charles de Gaulle (R91) during carrier qualifications aboard carrier USS Carl Vinson (CVN-70).

Russia wants to build a Supercarrier, and it's a total waste. By: Jeremy Bender 4/23/15

Russia's plan to expand its navy through the construction of an aircraft supercarrier is pretty much a tremendous waste, Nicholas Varangis of the Atlantic Council argues. Supercarriers, by nature, allow a country to project power throughout the world. An individual US supercarrier, for instance, can carry 70 aircraft anywhere in the world. This allows the US to hypothetically strike targets and make its influence felt the world over. In the growing tensions between the US and Russia, it is only natural that Moscow would like to challenge US naval supremacy and acquire a supercarrier of its own.

Currently, Russia only has one aging aircraft carrier compared to the US's fleet of 10 active carriers with two in reserve. Russia's proposed supercarrier will be able to carry over 100 aircraft, would feature catapults on the ship's top to launch aircraft during storms, and would be larger than US Nimitz-class supercarriers. However, as Varangis notes, the overall cost of the supercarrier would be "astronomical" and would involve "the cost of reorienting a naval industry around producing a ship of significant size."

And even then, after Russia actually builds the ship, it would have to invest heavily in the development of overseas ports in willing partner countries, which Russia is currently lacking, for the ship to have any strategic value. Even then, a supercarrier is only worth the expense if combined with a global foreign policy. Although Russia has increasingly aimed to increase its influence throughout Central and South America, by and large Moscow is confined in direct influence to its neighboring states in Eurasia. And even there, Russia is facing increased pushback from its distressed neighbors

The move to construct a supercarrier could be a move by Moscow to develop more global reach, but without the proper investments in global partnerships the carrier would become nothing more than an expensive vanity project. "A supercarrier is not a means unto itself," Varangis writes. "It is a unit of investment. Building a supercarrier without a corresponding foreign policy and supportive foreign naval bases is like buying a multi-billion-dollar casino chip and not playing any of the games."

"Russia's plan to build a supercarrier, if pursued, will likely involve tremendous expenses to retrofit Russia's navy and foreign policy with a ship that serves no strategic purpose," he concludes. In any case, the project is clearly in an ambitious, conceptual stage. Dmitry Gorenburg, an expert in the Russian navy at the Virginia-based CNA Corporation, told The Moscow Times that construction is years away and that even then it would take "at least 10, maybe 15 years" to build. A lot can happen in the meantime.

*Now go back and compare previous articles on carrier developments and deployments, and the activities and concerns addressed on this page to the Hendrix article on page one. England, France, India, Pakistan, China, Japan and Russia all want, or currently possess carriers. The intrinsic value of a carrier is not its war-fighting capability; its mere presence in theater is our Navy's, our military's and our country's greatest asset.*

# THE EVOLUTION OF WARFARE: THE TECHNOLOGY EXPLOSION AND VIETNAM; PART 1

The advancements in electronics in the '50's and 60's led to the divergence in missile development, and gave rise to the two distinct applications of aircraft launched missiles: Air to Air and Air to Ground. Before we take a look at the various weapons deployed with carrier air wings during the Vietnam War we need to have a basic understanding of the then emerging guidance technologies.

Guided missiles operate by detecting their target and then "homing" in on the target on a collision course. Although the missile may use radar or infra-red guidance to home on the target, the launching aircraft may detect and track the target before launch by other means. Infra-red guided missiles can be "slaved" to an attack radar in order to find the target and radar-guided missiles can be launched at targets detected visually or via an infra-red search and track (IRST) system, although they may require the attack radar to illuminate the target during part or all of the missile interception itself.

## Radar Guidance

Radar guidance is normally used for medium or long range missiles, where the infra-red signature of the target would be too faint for an infra-red detector to track. There are three major types of radar-guided missile - active, semi-active, and passive. Radar guided missiles can be countered by rapid maneuvering (which may result in them "breaking lock", or may cause them to overshoot), deploying chaff or using electronic counter-measures.

### Active Radar Homing

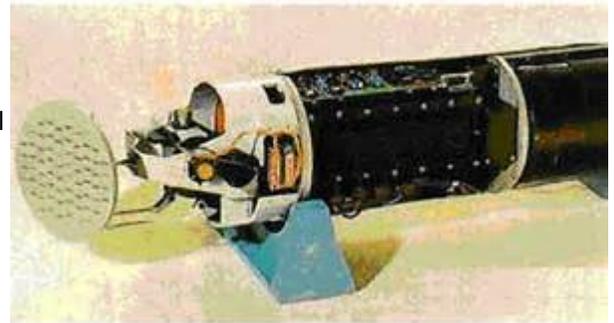
Active radar -guided missiles carry their own radar system to detect and track their target. However, the size of the radar antenna is limited by the small diameter of missiles, limiting its range which typically means such missiles are launched at a predicted future location of the target, often relying on separate guidance systems such as Global Positioning System, inertial guidance, or a mid-course update from either the launching aircraft or other system that can communicate with the missile to get the missile close to the target. At a predetermined point (frequently based on time since launch or arrival near the predicted target location) the missile's radar system is activated (the missile is said to "go active") and the missile then homes in on the target. If the range from the attacking aircraft to the target is within the range of the missile's radar system the missile can "go active" immediately upon launch. The great advantage of this system is that it enables a "Fire-and-forget" mode of attack, where the attacking aircraft is free to pursue other targets or escape the area after launching the missile

### Semi-Active Radar Homing

Semi-active radar homing (SARH) guided missiles are simpler and more common. They function by detecting radar energy reflected from the target. The radar energy is emitted from the launching aircraft's own radar system. However, this means that the launch aircraft has to maintain a "lock" on the target (keep illuminating the target aircraft with its own radar) until the missile makes the interception. This limits the attacking aircraft's ability to maneuver, which may be necessary should threats to the attacking aircraft appear. An advantage of SARH guided missiles is that they are homing on the reflected radar signal so accuracy actually increases as the missile gets closer because the reflection comes from a "point source": the target. Against this, if there are multiple targets, each will be reflecting the same radar signal and the missile may become confused as to which target is its intended victim. The missile may well be unable to pick a specific target and fly through a formation without passing within lethal range of any specific aircraft. Newer missiles have logic circuits in their guidance systems to help prevent this problem. At the same time, jamming the missile lock-on is easier because the launching aircraft is further from the target than the missile, so the radar signal has to travel further and is greatly attenuated over the distance. This means that the missile may be jammed or "spoofed" by countermeasures whose signals grow stronger as the missile gets closer. One counter to this is a "home on jam" capability in the missile that allows it to home in on the jamming signal.

### Beam Riding

An early form of radar guidance was "beam-riding" (BR). In this method the attacking aircraft directed a narrow beam of radar energy at the target. The air-to-air missile was launched into the beam where sensors on the aft of the missile controlled the missile, keeping it within the beam. So long as the beam was kept on the target aircraft, the missile would ride the beam until making the interception. While simple in concept, the difficulty of simultaneously keeping the beam solidly on the target (which couldn't be relied upon to cooperate by flying straight and level), continuing to fly one's own aircraft, all the while keeping an eye out for enemy countermeasures, can be readily appreciated. An added complication was that the beam will spread out into a cone shape as the distance from the attacking aircraft increases. This will result in less accuracy for the missile because the beam may actually be larger than the target aircraft when the missile arrives. The missile could be securely within the beam but still not be close enough to destroy the target.



AMR-1 Active Missile Guidance Radar

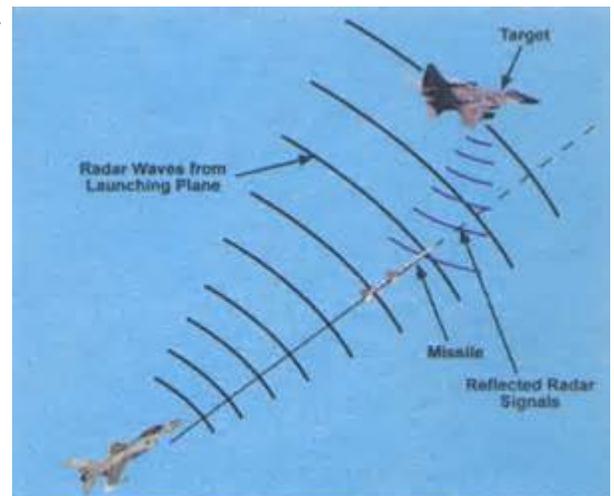
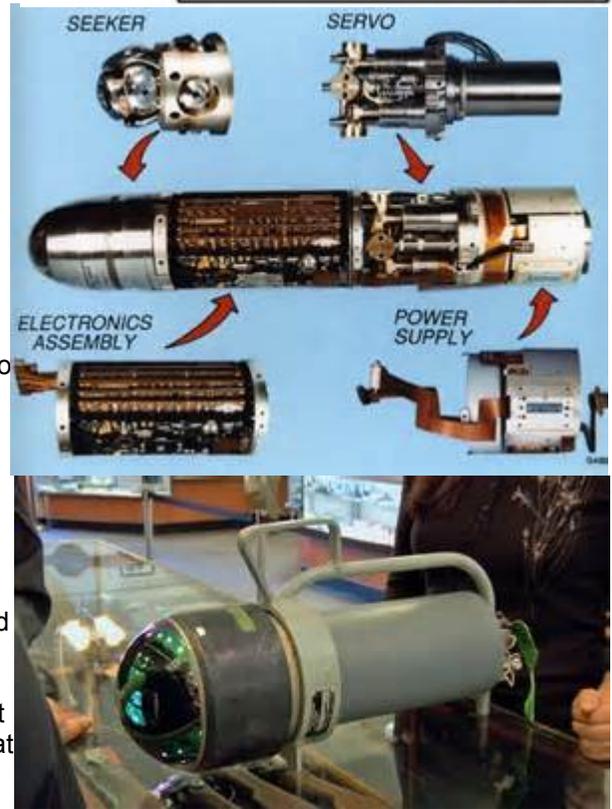
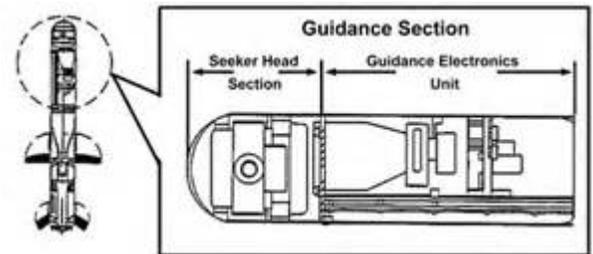


Fig. 2: A semi-active radar homing missile in pursuit of the target

## Infrared Homing

Infrared guided (IR) missiles home on the heat produced by an aircraft. Early infra-red detectors had poor sensitivity, so could only track the hot exhaust pipes of an aircraft. This meant an attacking aircraft had to maneuver to a position behind its target before it could fire an infra-red guided missile. This also limited the range of the missile as the infra-red signature soon becomes too small to detect with increasing distance and after launch the missile was playing "catch-up" with its target. Early infrared seekers were unusable in clouds or rain (which is still a limitation to some degree) and could be distracted by the sun, a reflection of the sun off of a cloud or ground object, or any other "hot" object within its view. More modern infra-red guided missiles can detect the heat of an aircraft's skin, warmed by the friction of airflow, in addition to the fainter heat signature of the engine when the aircraft is seen from the side or head-on. This, combined with greater maneuverability, gives them an "all-aspect" capability, and an attacking aircraft no longer had to be behind its target to fire. Although launching from behind the target increases the probability of a hit, the launching aircraft usually has to be closer to the target in such a tail-chase engagement. An aircraft can defend against infra-red missiles by dropping flares that are hotter than the aircraft, so the missile homes in on the brighter, hotter target. In turn, IR missiles may employ filters to enable it to ignore targets whose temperature is not within a specified range.

Towed decoys which closely mimic engine heat and infra-red jammers can also be used. Some large aircraft and many combat helicopters make use of so-called "hot brick" infra-red jammers, typically mounted near the engines. Current research is developing laser devices which can spoof or destroy the guidance systems of infra-red guided missiles. See Infrared countermeasure. Start of the 21st century missiles such as the ASRAAM use an "imaging infrared" seeker which "sees" the target (much like a digital video camera), and can distinguish between an aircraft and a point heat source such as a flare. They also feature a very wide detection angle, so the attacking aircraft does not have to be pointing straight at the target for the missile to lock on. The pilot can use a helmet mounted sight (HMS) and target another aircraft by looking at it, and then firing. This is called "off-boresight" launch. For example, the Russian Su-27 is equipped with an infra-red search and track (IRST) system with laser rangefinder for its HMS-aimed missiles.



F-4 Phantom Infra-Red Heat Seeking Unit

## Electro-Optical

A recent advancement in missile guidance is electro-optical imaging. The Israeli Python-5 has an electro-optical seeker that scans a designated area for targets via optical imaging. Once a target is acquired, the missile will lock-on to it for the kill. Electro-optical seekers can be programmed to target a vital area of an aircraft, such as the cockpit. Since it does not depend on the target aircraft's heat signature, it can be used against low-heat targets such as UAVs and cruise missiles.

## Anti-Radiation Missile

Evolving missile guidance designs are converting the anti-radiation missile (ARM) design, pioneered during Vietnam and used to home in against emitting surface-to-air missile (SAM) sites, to an air intercept weapon. Current air-to-air passive anti-radiation missile development is thought to be a countermeasure to airborne early warning and control (AEW&C - also known as AEW or AWACS) aircraft which typically mount powerful search radars. Due to their dependence on target aircraft radar emissions, when used against fighter aircraft passive anti-radiation missiles are primarily limited to forward-aspect intercept geometry. Another aspect of passive anti-radiation homing is the "home on jam" mode which, when installed, allows a radar-guided missile to home in on the jammer of the target aircraft if the primary seeker is jammed by the electronic countermeasures of the target aircraft.



## NEXT TIME:EVOLUTION OF WARFARE;THE TECHNOLOGY EXPLOSION AND VIETNAM; PART 2