Missions for America
Semper vigilans!
Semper volans!

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CURRENT EVENTS

Koreasat-6A launched

Koreasat-6A, a communications satellite was inserted into a geostationary orbit by a SpaceX Falcon 9. The launch was made on November 11th from Kennedy Space Flight Center. Koreasat-6A replaces the Koreasat -6 which has been in orbit since 2010.

Falcon 9 Away! *(Credit: SpaceX)*

FEATURE ARTICLE

Precision Weaponry

Part Two
Bombs and Missiles
by
Stephen M. Rocketto

Measuring Precision of Missiles and Strategic Applications

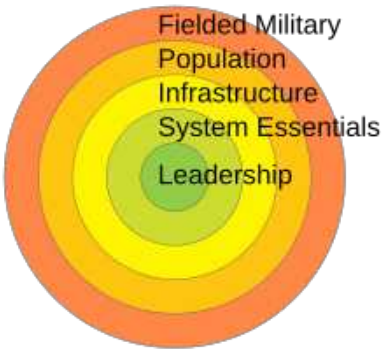
The precision of missiles is generally represented by a measurement known at the Circular Error of Probability CEP) which is defined as radius of a circle, centered on the aim-point, that is expected to enclose the landing points of 50% of the munitions. In World War Two, the Army Air Force considered the Norden Bombsight as the solution to the strategy of precise daylight bombing. Under ideal test conditions, clear skies and no enemy opposition, trained bombardiers had a CEP of 400 feet from an altitude of 15,000 feet. In flak filled skies and cloudy skies of Europe, the bombers flew at around 25,000 feet and around 30% of the bombs would land within 1,000 feet of the aiming point.

Now, the technology available makes real precision a reality. The last section of this essay will consider a wide range of weaponry to precision guided munitions (PGM) based upon the method used to guide them. It will include air-to-air rockets, surface to air rockets, anti-tank rockets, anti-ship torpedoes and precision guided gravity bombs.

Classic western military strategy can be summarized by looking at Carl von Clausewitz emphasized attacking the enemy's center of gravity, a focal point which generally meant striking the enemy's fielded military, population centers or infrastructure such as transportation or industrial plants.

In 1995, Col. John Warden III, USAF, published his Five Ring model which prioritized striking the leadership, cutting the head off the snake, which will cripple the fielded military. The Israeli

Defense Forces have applied this strategy to the leadership of the terrorist forces of Hezbollah in Lebanon and Hamas in Gaza. A secondary mission is to destroy the system essentials by bombing the weapons depots and rocket launchers. Precision guided munitions make this possible



Savior Generals, a book by Victor Davis Hanson, attributed then Maj. Gen. William Tecumseh Sherman with a strategic model closely resembling Warden's Five Rings. Horrified by the carnage of frontal attacks, Sherman decided that facing a fielded military often result in a pyrrhic victory, one in which the field is won but at such cost that it is akin to a defeat. He decided that after taking Atlanta, his Army of the Tennessee would concentrate on punishing the aristocratic slave owning plantation owners, destroying plantations, mills and military infrastructure. The small farmers and shop owners were to be treated humanely and their property was exempt from destruction.

Essentially, Sherman waged a war against the system essentials and enemy industry. He never went after the top leadership but by destroying the wealth and morale of the slave-owning ruling class, he achieved a result akin to what the Israeli's have managed to do to Hezbollah in Lebanon. The Israelis have used explosive pagers and walkie-talkies.and precision bombing of Hezbollah to unrelentingly decapitate the Hezbollah leadership cadre, destroy their weapons caches and encumber their fiscal activities.

At the conclusion of his “march to the sea, he reached Savannah and pressed northward towards the rear of Lee's Army of Northern Virginia which was engaged with Grant's Army of the Potomac. One the one month campaign, his 62,000 man force suffered around 1,500 casualties about half of the Confederate count, Compare this with the three days of Gettysburg which cost the Union 23,000 and the Confederacy between 23,000 and 28,000 men. Sherman is famed for saying “War is hell!” but he made serious efforts to reduce the cost to both his soldiers and innocent civilians.

(Credit:: George N. Barard)

Excerpts for *Marching Thorough Georgia*
Henry Clay Work-1865

(last verse)
So we made a thoroughfare for Freedom and her train,
Sixty miles in latitude, three hundred to the main;
Treason fled before us, for resistance was in vain,
While we were marching through Georgia.

(chorus)
Hurrah! Hurrah! We bring the Jubilee.
Hurrah! Hurrah! The flag that makes you free,
So we sang the chorus from Atlanta to the sea,
While we were marching through Georgia.

Precision Weaponry
What Can Go Wrong?
Plenty!

Good intelligence is required to make the precise strikes. In 1999, U.S guided bombs meant for a Yugoslavian military target took out the People's Republic of China Embassy in Belgrade. They used the wrong street address in programming the bombs.

During the Gulf War, a public bomb shelter in Baghdad was struck by F-117s using a 2,000 lb GBU-27 laser guided bombs killing 408 people. The target folder stated that the "shelter" was a center for Iraqi leadership.

In World War II, the Eighth Air Force equipped with the Norden Bombsight bombed Switzerland around 70, repeat 70 times. Navigation errors compounded by shaky wind forecasts and overcast skies resulted in hefty reparation payments.

A precision missile might also go awry if the grid coordinated entered for the target are wrong.

Infrared trackers can be spoofed by the use of decoy flares our locking on to another bright source such as the sun.

GPS is subject to jamming as is radar. Consequently, precision munitions often use a second type of homing devices.

During the Vietnam unpleasantness, the radar guided sparrow missile often failed due to the harsh climate or rough handling by the ordnance crews.

A cruise missile which uses contour mapping must first be provided with an accurate topography to follow. This generally requires a specially instrumented aircraft to fly the route and obtain the lay of the land and obstacles. This might not be practical.

Optical guidance is dependent upon clear air and a target contrast with the background. Clouds, smoke, haze and camouflage will degrade performance. The skill of the operator must also be taken into account.

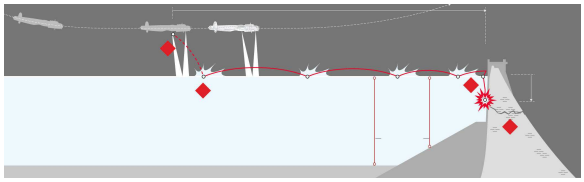
Optical Guidance

One of the major RAF raids in World War II was carried out using a cheap wooden bomb sight and some small spotlights. Operation Chastise was the code name for the attacks on the Möhne, Edersee and Sorpe dams carried out by 18 Avro Lancaster Bombers of 617 Squadron.

The weapon was the "bouncing bomb," actually a depth charge containing three tons of Torpex, a mixture of TNT, RDX and powdered aluminum. Before launch motors set it spinning counter-clockwise as seen from the starboard side of the aircraft. Spin rate was 500 rpm and aircraft speed was 240 mph.

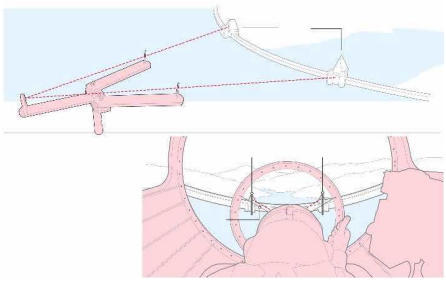
The cradle and bomb were mounted externally.

The exact height of release, 60 feet, was established by overlapping the beams of two Aldis lamps which were visible on the water below.

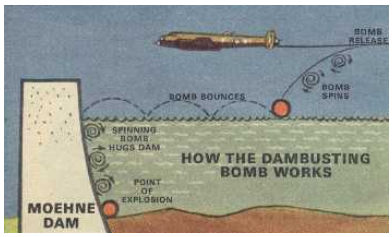


The point of release was set when the two pins on the bombsight coincided with the intake towers flanking the main dam wall.

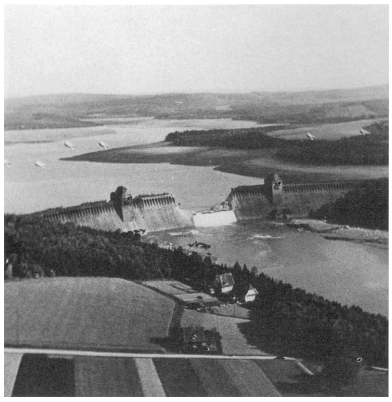
The Dann Bombsight



When the bomb it dropped its spin forces it to skip along the water three times until it hits the dam wall. The spin now makes the bomb travel down the wall until a hydrostatic fuse set it off at 30 feet. If the fuse failed, a timer initiated a fuse 90 seconds after release.



Two of the dams were breached. The Sorpe survived.



Möhne Dam breached. *(Credit: Flying Officer Jerry Fray RAF)*

It also worth mentioning the Divine Wing of Japan, the Kamikaze. Aircraft, often obsolescent but carrying a bomb and manned by mostly green pilots who used their Mark 1 eyeballs to deliberately crashed into targets of opportunity, especially U.S. Navy ships.. In the three month battle for Okinawa, the Kamikazes sank 36 ships and damaged 386 more. Similarly, fanatic terrorists wearing explosive vests. And for those with short memories, remember 11 September, 2001.

Lt. Yoshinori Yamaguchi's Yokosuka D4Y3 "Judy"diving at USS Essex on 25 November 1944. The attack left 15 killed and 44 wounded.

26 May 1945. Corporal Yukio Aaraki, holding a puppy, with four other pilots of the 72nd Shinbu Squadron. Araki died the following day, at the age of 17, in a suicide attack on ships near Okinawa.

Laser Guided

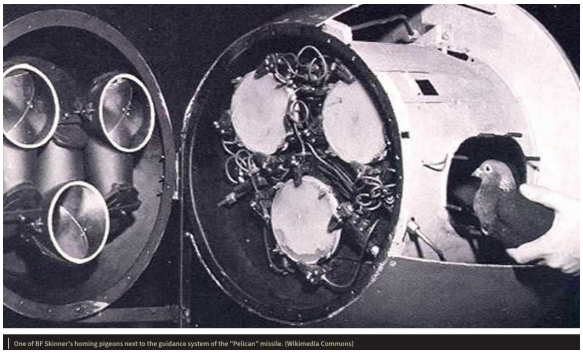
During the First Gulf War in 1991, Royal Air Force Blackburn Buccaneers operated in pairs, each with a pilot flying solo. One Buccaneer would release a Paveway laser guided bomb and the wingman would illuminate the target with a laser.

The HELLfire (originally the **He**liborne **l**aser **fire**-and-forget missile) is commonly carried by a helicopter or a sophisticated drone but can be ground launched or ship launched. One variant does use an active radar guidance system. It carries a 100 pound warhead.

A General Atomics LQ-9 Reaper launching an HELLfire missile

A bizarre attempt during World War Two was an experiment, Project Orcon (Organic Control) conducted by Harvard psychologist B.F. Skinner to use operant conditioning to train pigeons to guide a glide bomb by pecking on a touch TV

screen.

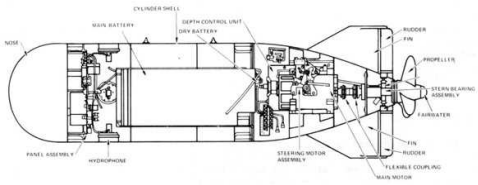


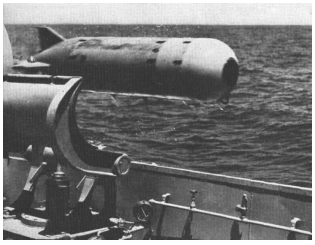
(Credit: B.F.Skinner Foundation)

Pigeons were trained by rewarding them with food whenever the pecked on a target, a ship, projected on a primitive touchscreen. Centered pecks would not alter the course of the bomb but off-center pecks would alter the course. The three kamikaze pigeons were used in a majority voting system and the pigeon which was outvoted was not rewarded. The Navy was dubious about its practicality and cancelled the program.

Acoustic Guidance

The U.S. Navy developed the Mark 24 Mine or Fido (cover names), an acoustic homing torpedo for anti-submarine warfare.





(*Credits: U.S. Navy)*

Four crystal hydrophones were symmetrically placed around the body of the torpedo and it steered towards the loudest sound. It was generally dropped from an aircraft but could be launched from a torpedo tube.

Radio Controlled Guidance and the Visible Spectrum

The earliest PGMs used radio control or sound to prosecute a target. The Ruhrstal Fritz-X was an anti-ship glide bomb.

Fritz-X

When launched, a flare in the tail enabled the bombardier to follow it and adjust its course manipulating the tail fins by radio control. In its first operational use, two of them sank the Italian battleship *RN Roma*.

Rather than track the weapon using the Mk.1 eyeball, the U.S. Navy in the 1960 developed the Martin-Marietta AGM-62 Walleye, an unpowered glide bomb to attack surface targets. Walleye incorporated a television system so the operator could guide it by watching it on a monitor.

Walleye

The Infrared Spectrum

All of the former systems operated within the visible spectrum. What about the infrared wavelengths? One of the most successful IR missiles was the U.S. Navy developed the short range Ratheon/Loral Martin AIM-9 (**A**ir **I**nterception **M**issile) Sidewinder. The sidewinder is a pit viper which used infrared sensors in its head to hunt prey.

Sidewinder
(Credit: David Monniaux)

IN 1958, a Republic of China F-86 fired at a MiG-17 of the People's Liberation Air Force. The missile struck the MiG, failed to fire and embedded itself in the MiG's airframe. The MiG survived and carried the Sidewinder back to its base.and turned it over to the Soviets. They reverse engineered it and produced the AA-2 Atoll.

A missile often carried along with Sidewinders by U.S fighters is the medium range AIM-7 Sparrow. It carries a Raytheon semi-active radar homing system. The attacking aircraft “lights up” the prey with its onboard radar. The missile uses a smaller radar to locate the prey and a feed between the missile and the launching aircraft provides guidance information.

Fox One is the NATO call announcing the launch of a semi-active radar homing missile.

For long range, the Hughes/Raytheon AIM-54 Phoenix carried by the F-14 Tomcat was employed to defend carrier battle groups. The Phoenix used semi-active radar homing and switched to active radar homing in the terminal phase of the flight. Semi-active radar homing. Active radar homing utilizes a radar transceiver and can track a target autonomously. Semi-active radar homing uses a receiver only.

(Credit: Department of Defense)

National Bureau of Standards ASM-N-2 Bat Radar Guided Glide Bomb

Bat mounted on a Consolidated PB4Y-2 Privateer

The Bat was equipped with an active radar guiding system and carried a 1000 pound warhead. It found primary use against ships and bridges in Burma. Gyro stabilization and a movable elevator kept the Bat on course over a range of 15 to 20 miles. However, the “primitive” radar could be “confused” by ground clutter if a bridge or ship close to shore was targeted.

RIM-66 Standard

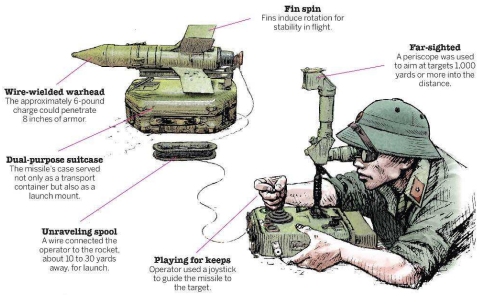
The Standard has over a dozen variants but most are guided by combinations of semi-active radar and inertial or infrared systems.

Today, the RIM-66 Standard anti-aircraft missile has been expended at an alarming rate in the Red Sea. It is being used to take down the Iranian

supported Houthi missiles and drones launched from Yemen. At $2 million a shot, its cost effectiveness must be questioned since the Houthi munitions are valued in the thousands of dollars. Some of our destroyers have expended their entire armory of Standards and have to have their stores resupplied. A typical destroyer has 90 launch cells but some of them are filled with anti-submarine and Tomahawk cruise missiles.

Wire Guidance

Wire guidance has been used in both anti-tank missiles and torpedoes.The Soviet AT-3 Sagger is a man portable anti-tank missile.



The Sagger trailed a wire connected to the operator's control panel. The operator observed the missile through an optical system aided by a red light in the tail of the Sagger. During the Yom Kippur War, Egyptian Saggers took a heavy toll of Israeli armor.

The British Tigerfish torpedo is wire guided to the general vicinity of the target where a passive sonar is used for the final phase of the attack.

During the Falklands War, two Tigerfish launched from *HMS Conquerer* sank the Argentine light cruiser *ARA Belgrano*. *Belgrano* was formerly the *U.S.S. Phoenix*, a Pearl Harbor survivor.

Inertial Navigation and GPS Systems

A versatile land attack cruise missile is the BGM-109 Tomahawk.

Tomahawk at the Submarine Forces Museum in Groton, Connecticut

The Tomahawk can use inertial navigation, contour mapping or GPS to find its target. An inertial guidance systems uses gyroscopes to monitor the position, velocity (speed and direction) and the acceleration of a vehicle. Once the launch location and target location are programmed into the system, the vehicle can navigate independent of any external source.

Contour mapping used an onboard contour map of the terrain and a radar altimeter to navigate to on a preplanned route to the target.

GPS relies on the **G**lobal Positioning **S**ystem satellite constellation. The vehicle's GPS unit locates three or four GPS satellites. A four satellite hook-up will allow altitude determination as well as the latitude-longitude position of the vehicle. Fundamentally, the times which it takes for the satellite signals to reach the vehicle receiver established distance relationships between the each of the satellites and the vehicle which provides the data for determining the latitude, longitude and height above mean sea level.

The AGM-86 Air Launched Cruise Missile (ALCM) is a stand-off weapon carried by a B-52H. The AGM-86B uses terrain contour-matching guidance system. The AGM-86C uses inertial guidance linked to GPS.

AGM-86
(Credit: R.L. House)

Another piece of ordnance which yokes inertial guidance and GPS is the Joint Direct Attack Munition (JDAM). JDAM is a kit which takes a "dumb" gravity bomb and and converts it into a PGM. Basically, the kit uses a gimbaled laser on the nose which illuminates the target. As the bomb falls, the reflected signal is detected by receivers on the bomb. GPS data provides the speed and direction of the falling bomb and operate the aerodynamic control surfaces which constantly correct the course of the weapon.

A typical JDAM is the Raytheon GBU-24 Paveway III which might be attached to a conventional 2000 pound Mk 82 bomb or a 2000 pound BLU-109 penetration bomb ("bunker buster"). The CEP is about 25 feet.

Paveway III

The Army has coupled GPS and inertial guidance to produce the truck mounted M142 High Mobility Artillery Rocket System (HIMARS). The munition is capable at half range, 150 miles of striking within 3 feet of the chosen target.

The U.S. Army developed the MGM-51 Shillelagh to arm the M551 Sheridan light tank.

The Martin-Marietta M712 Copperhead was a laser guided artillery round fired from a 155 mm howitzer. A forward observer would use a laser to illuminate the target and the Copperhead would home in on the reflected light. It was used in the mid-east desert wars and reportedly used by the Ukrainians today.

Typical rounds and the M109 howitzer

The XM395 precision-guided mortar round consists of a kit which replaces the fuze of the standard 120 mm mortar round with a GPS guidance unit and a tail with guidance fins.

(Credit: U.S. Army)

What Counts as Precise?

Close Only Counts in Horseshoes and Hand Grenades

The damage done is dependent upon the CEP and the size of the warhead. An ICBM with a thermonuclear device has a CEP of 100 m, sufficiently close to claim precision.

JDAMs have a CEP of around 10 meters, artillery and laser guided munitions run around a five meter CEP and anti-tank missiles and drone launched missiles will strike within a meter of the aim point.

But this means that conditions are ideal which in the chaos of battle will not be the case.

Aircraft can be equipped with targeting pods. Some aircraft do not have the requisite or sufficient electronics for a successful attack. A

targeting pod makes up for this deficiency.

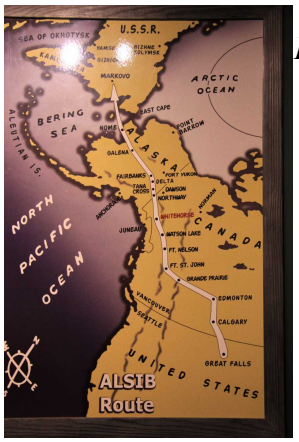
Pave Spike Targeting Pod

The are generally attached to a external pylon on the aircraft and provide information about identifying targets and guiding the PGM. They are most often used for laser and infrared guiding but can also provide some navigation data.

Sniper Advanced Targeting Pod on a Super Hornet.

AEROSPACE HISTORY AND CHRONOLOGY

Nov. 20, 1942 – The need to defend Alaska and provide a route to deliver lend-lease aircraft to Russia demanded an overland supply route and a string of airfields. On this date, that need was met by the completion of the Alaska-Canada (ALCAN) highway.



In the early '70's, the Editor, his brother Hap and the Duke of Tewk made the journey over the still unpaved ALCAN.

Circle City, population about 100, at the end of the Steese Highway on the Yukon River and 50 miles south of the Arctic Circle

The accomplishment was arguably the most difficult construction project since the digging of the Panama Canal. Over 10,000 Army engineers and private contractors survey and constructed 1,500 miles of highway and around 100 airfields and emergency land strips in eight months and eleven days.

Commander of the operation was Brig. Gen William M. Hoge, the creator of the military obstacle course. The route is from Dawson Creek, British Columbia to Delta Junction, Alaska. Weather, primitive living conditions and swarms of mosquitos were just some of the miseries faced by the construction crews.

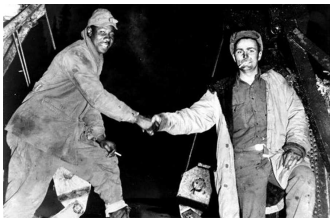
Technical problems such as a method to build roads on a permafrost surface had to be solved as well as adapting machinery to work in the uncompromising environment. Ironically, Hoge's new job was to eliminate the natural obstacle course of mountains, rivers, bogs, and forest which lay between the United States and Alaska.

A social problem arose when manpower shortages led to a decision to use the newly formed Negro units, the 93rd Engineer General Service Regiment, 95th Engineer General Service Regiment, and the 97th Engineer General Service Regiment and later, the 388th Engineer Battalion. Brigadier General Simon Bolivar Buckner, Jr, commander of the Alaska Defense Command, exemplified the hostility directed against these American soldiers. Reflecting the racism of the times, he feared that they would

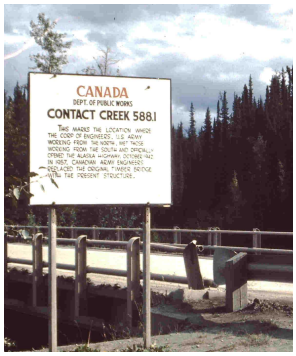
...interbreed with the Indians and Eskimos and produce an astonishingly objectionable race of mongrels that would be a problem here from now on. I have no objection whatever to your employing them on the roads if they are kept far enough from the settlements and kept busy and then sent home as soon as possible.

Lt. Gen. Buckner was the son of Confederate general Simon Bolivar Buckner. He was killed by artillery fire on Okinawa while in command of the 10th Army. Buckner and Lt. Generals Lesley J. McNair, Frank Maxwell Andrews and Millard Harmon were the highest ranking Americans to be killed in World War Two.

Nonetheless, the Afro-American units comprised about one-third of the total manpower and were instrumental to the success of the project. Their work contributed to the 1948 decision by President Harry S. Truman to desegregate the armed forces.



Black and White soldiers shake hands when the meet and join the two final segments of the ALCAN.



The air corridor known as the Northwest Staging Route or the Alaska-Siberia (ALSIB) Lend-Lease Route involved flying the aircraft from Great Fall, Montana to Fairbanks, Alaska where Soviet airmen waited to take over and continue the flight into the Soviet Union. Approximately 8,000 planes were delivered in 21 months of operation with only 133 losses. A trip from Montana to final delivery took around a month.

The United States provided around 18,000 aircraft to the Soviet Union under lend-lease and 44% of these came by way of the ALSIB. Most of these were Bell P-39 Airacobras and P-63 Kingcobras, the North American B-25 Mitchell and Douglas A-20 Havocs and C-47 Skytrains.

Commemorative pins issued by the Soviet government celebrating the ALSIB.

Airacobra at the Molino Museum outside Moscow.

King Cobra with ferry tanks.

Havoc poised for combat.

Mitchell on display at Molino.

Salvage of wrecked Gooney Bird recently discovered in Siberia.

Other delivery routes were through Iran which the Soviet Union and Great Britain had occupied and by ship to Vladivostok on the Sea of Japan and Murmansk on the Barents Sea.

Nov. 21, 1981– The Civil Aeronautics Board instituted a one week ban on Aeroflot flights from New York to Moscow. On November 8th, two Ilyushin IL-62 airliners, one inbound and one outbound flew over what the government termed "sensitive areas" in New England, notably Groton's United States Submarine Base and the General Dynamics Electric Boat shipyards where the new Trident submarines were under construction.

Round up the usual suspects!

According to a US-USSR treaty regarding commercial air travel, Moscow-to-Washington flights are required to approach the US near the coast of Maine and then swing out over the Atlantic Ocean, skirting military bases and a band of defense-related industries in southern Connecticut.

To show that they did not discriminate among enemies, on the next day, the same Aeroflot IL-62 on its return flight overflew RAF Boulmer, a British radar station which was being modernized. The aircraft switched off its transponder which informed air traffic control of its position and altitude and then descended from 35,000 feet to 10,000 feet, just under the cloud level, a clear violation of air traffic regulations and patent indication of intent to spy.

Nov 22, 1947 – Martin was one of the aircraft firms which made a post-war foray into commercial aviation in the hopes of building a replacement for the DC-3. Given the availability and purchase cost of surplus Gooney Birds and their utility and low cost of operation, they were entering a tough market with their new 2-0-2.

A Columbian registered Aero Proveedora 2-0-2 at Fort Lauderdale. (Credit: RuthAS)

And then the 2-0-2 encountered a major problem. In August of 1928, a 2-0-2 had its port wing separate in flight with 37 fatalities. The cause was traced to metal fatigue in a wing spar made from an aluminum alloy prone to stress-corrosion cracking. The fleet was grounded and the problem was fixed but the delay was damaging.

In the interval, the Convair 240, a competitive design which also featured pressurization, a feature not shared by the 2-0-2, seized the opportunity and took a large share of the market.

Martin responded with an upgraded model, the 4-0-4 but it was too little and too late. The combined production for both aircraft was only 150 and the Convair 240 and its successor models reached 1,800 units.

The Coastwatcher Editor's first airliner ride was on an American Airlines 240 from Logan to LaGuardia and CBS paid for it.

The only known survivor is a former Allegheny Airlines 2-0-2 which is under a slow restoration at Teterboro's New Jersey Aviation Hall of Fame and Museum.

Nov. 23, 1947– First flight of the Convair XC-99. A company that can build a commercial aircraft which has been partially subsidized by one which was previously developed for the military is fortunate indeed. Much of the cost is amortized by military spending and a better price can be offered for the follow-up commercial model. Consider Boeing and the highly successful C-135/707 line.

Convair used the wings, other parts, and tooling which produced the B-36 Peacemaker to build the sole XC-99 which never had a name but if successful could have been called the "Moneymaker."

XC-99 leads a B-36 (Credit: USAF)

The Air Force did not look with favor upon the possibilities offered by mass production of the XC-99 but the sole prototype turned out to be a workhorse and found a place in the Air Force stable. Most of its trips were cargo shuttles used to support the B-36 fleet and she logged 7,400 hours of service carrying a total of 60 million pounds of freight.

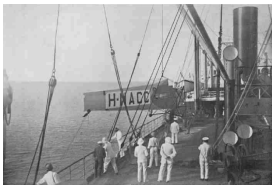
In 1957, it made its last flight to Kelly AFB, San Antonio where it bedded down for 47 years and slowly corroded. At that point, the Museum of the United States Air Force took an interest and asked that it be flown to Dayton. But the $7,400 bill for the flight (ironically the same number of hours which the aircraft logged) led the cold-hearted bean counters to veto the request.

By around 2005, parts of the aircraft did find their way to Dayton but lack of funding prevented a full more and restoration so a decision was made to move the parts and the fuselage, still in Texas, to the storage facilities at Davis-Monthan AFB, Tucson, where the dry climate would slow deterioration.

Nov. 24, 1924 – A Fokker F.VIIA completes the first flight from the Netherlands to their colony, the Dutch East Indies: 55 days with a flight time of 127 hours. At some place, sources say Bulgaria, the engine was replaced! The plane was then disassembled and returned to Europe by ship and returned to service but was destroyed in an accident in Belgium in 1927.

The Fokker

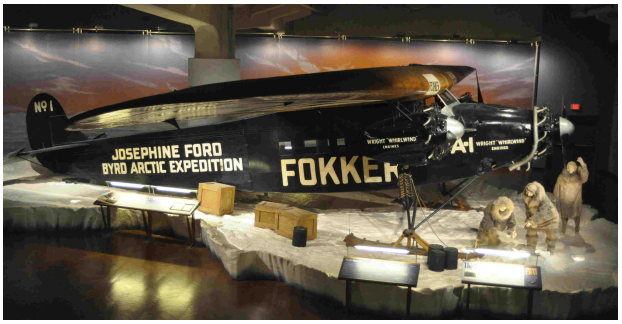
Loading the disassembled aircraft on a ship.



Five years after the initial trip, KLM started scheduled service from Amsterdam to Batavia, now Jakarta, Indonesia. The aircraft of choice was Tony Fokker's modification of the single engine F.VIIA. Basically, he added two engines, making it a trimotor and named it the F.VIIA/3M. The design was further modified with a longer wing span and more powerful engines and became an aircraft of choice for record setting flights.

In 1927, Maitland and Hegenberger in a craft named *Bird of Paradise* made the first trans-Pacific flight from the continental United States to Hawaii. Kingsford Smith and the *Southern Cross* was first from the United States to Australia in 1928. Carl Spaatz and his crew in the *Question Mark* sent a 150 hour endurance record using

aerial refueling in 1929.



A diorama of the Byrd Antarctic Expedition at the Henry Ford Museum. The aircraft was the first to fly over the South Pole.

But in 1931, the Fokker reputation faltered and fell. A Transcontinental and Western Fokker crashed killing among others, noted Notre Dame football coach Knute Rockne. The investigation indicated that delamination of the wing structure led to the crash. This led to a major revolution in commercial aircraft design, the shift to all-metal construction such as the Ford Trimotor and the development of the Boeing 247 and the DC-2.

Nov. 25, 1940-First Flights by Two Hot Aircraft

The Wooden Wonder

First flight of the de Havilland DH.98 Mosquito, arguably, one of the ten best aircraft produced in WWII.

The Mosquito was a private venture by de Havilland and the company sought to meet the Air Ministry requirements for a fast twin engine medium bomber. Geoffrey De Havilland, Sr. looked back to their very successful DH.88 Comet racer and a sleek four engine mail-plane, the DH.91 Albatross built from a plywood-balsa laminate, saw much merit, and proposed a wooden, aerodynamically clean model which powered by the new Rolls-Royce Merlin engine, could outstrip pursuing fighters. So would need no defensive armament and required a crew of only two men. Wood construction meant it could be built by the semi-skilled carpentry industry and battle damage could be easily repaired with non-strategic materials. The Air Ministry was unimpressed but de Havilland was undeterred.

The Air Ministry was insistent on defensive armament which de Havilland saw as only adding weight and drag and additional crew members. Air Chief Marshal Wilfred Freeman, the visionary officer in charge of selecting new aircraft was a partisan of de Havilland and managed to over-ride the resistance of powerful figures such as Lord Beaverbrook, Minister of Aircraft Production, and de Havilland was given the go-ahead to manufacture a single prototype.

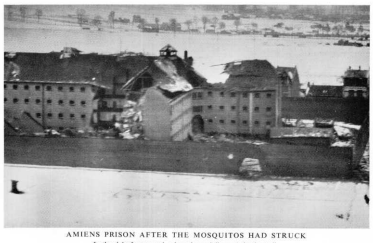
The original prototype is preserved at the de Havilland Aircraft Museum, Salisbury Hall, London Colny, England.

On first test flight was flown by Geoffrey de Havilland, Sr. accompanied by John Walker, chief engine installation designer. After overcoming the usual teething problems faced by any new aircraft, the Mosquito demonstrated its speed, outracing Spitfires in performance tests and its flexibility not only as a light bomber but as a reconnaissance aircraft and cannon equipped fighter was realized.

The Mossie may have been the most versatile aircraft of the war. Name the task. A low-level precision attack on a Gestapo headquarters: Copenhagen, Denmark or Oslo, Norway. Blow down some prison wall to provide an opportunity for captured resistance members to escape: Amiens, France.

Operation Carthage-Gestapo HQ burning. Note the Mosquito banking left.
(Photo Credits: Royal Air Force/Imperial War Museum)

Operation Jericho-Note the hole in the Amiens prison wall through which the prisoners could escape.



High altitude night bombing. Send Bennett's Pathfinders, the Light Night Striking Force. As a fighter, its four 20mm cannons and four .303 machines guns were adequate day and night and provided a powerful punch for strafing. Try reverse lend-lease and give the Yanks some for weather and photo reconnaissance re-designated the F-8.

USAAF F-8 *(Credit: Museum of the U.S. Air Force)*

Paint the British Overseas Airways Corporation (BOAC) name on and give it a civilian registration and sheep-dip some RAF pilots, dress them in mufti and you have the "Stockholm Express."

Head north to neutral Sweden and bring back a cargo of precision ball bearings or diplomatic bags or intelligence documents. And since you are a BOAC flight why not passengers. The nuclear physicist Neils Bohr, one step ahead of the Nazis, came back via Denmark and Sweden lying on a mattress in a bomb-bay, strapped to a parachute with an oxygen bottle at his side. Final destination, the United States where he contributed to development of the initiator for the atomic bomb.

The Martin Murderer

First flight of the Martin B-26 Marauder- Arguably, one of the most maligned aircraft produced in WWII. As much as the Mossie was praised, the Marauder was cursed.

The Marauder, not to be confused with the later Douglas A-26 which for a time bore the B-26 designation, was designed for speed with a short low aspect ratio wing. This resulted in a wing loading (aircraft weight/wing area) of 53 lb/ft^2, a higher if not the highest wing loading of any military aircraft at that time. It was twice that of a Spitfire and about equal to that of a modern Lear 31. The effect on performance is a higher stall speed and reduced maneuverability.

A combination of high stall speeds and inexperienced pilots led to many crashes, especially on turns in the traffic pattern and on final approach. The plane acquired a number of disparaging nick-names such as the Baltimore Streetwalker, a reference to the Maryland factory in which it was produced and the belief that it was "fast and had "no visible means of support." Pilot training took place at McDill Field near Tampa, Florida and the catchphrase became "One a day into Tampa Bay."

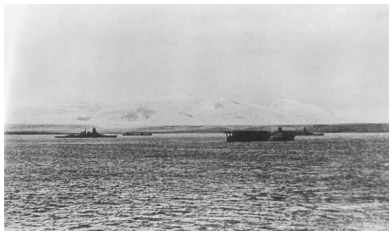
The morale issue which resulted lead to special training and aircraft modifications. No less a figure than Jimmy Doolittle lectured about speed control and demonstrated flight with one propellor feathered. Women ferry pilots were assigned to fly Marauders to different bases with the intent to mortify the male pilots who were chary about flying the plane.

Martin added six feet to the wing, increased its angle of incidence, enlarged the vertical stabilizer and rudder, installed more powerful engines in the new models and emphasized the need to practice good speed control. The modifications and improved training worked.

By war's end, over 5,000 had been produced and it became an excellent medium level bomber. Around 1954, the Editor was seeking to earn the Aviation Merit Badge and his counselor turned out to be a former Marauder pilot. When questioned, he reported favorably about his experiences saying it always got him home.

As it turns out, them much maligned Marauder had the lowest combat loss rate of any other aircraft but when the war ended, the Air Force eliminated them from the inventory and most were scrapped.

Nov. 26, 1941 (Tokyo Time) – Hitokappu Bay, Etorofu Island, the Kuriles – After the First Air Fleet air units returned from training in Kagoshima, Admiral Chuichi Nagumo orders anchors weighed and the Imperial Japanese Navy's Kido Butai (Mobile Force) sails east: destination-a point approximately 230 miles north of the Hawaiian Island of Oahu.



Nagumo and Battleship Kirishima, Carrier Kaga, and Battlecruiser Hiei at anchor in Hitokappu Bay.

TRCS ACTIVITIES

Visit to Danielson

Maj Roy Bourque, Capt Steven Deignan-Schmidt and Lt Col Rocketto attended the November 14th meeting of the Danielson Cadet Squadron to celebrate C/2sLr Ethan Danner's Mitchell award ceremony.

Capt Kristina Golden was master of ceremonies and lead the cadets, senior members and parents in the Pledge of Allegiance/

SM Lindsay Joclyn reviewed the requirements which must be met to achieve the Mitchell Awards and promotion.

Lt Col Rocketto offered an illustrated biographical outline of Billy Mitchell's life and accomplishments.

Mr. and Mrs. Danner affix C/2d Lieutenant's epaulettes.

Maj Bourque presented Danner with a citation for the Connecticut State Legislature which was sponsored by the Hon. Doug Dubitsky, Connecticut House of Representatives, 47th District.

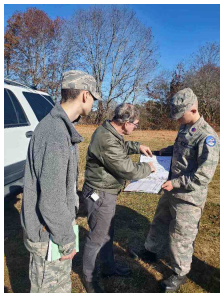
The meeting concluded with a collation of cheeses, cold meats, vegetables, cake and drinks.

TRCS Training

On Sunday November 17, Maj Roy Bourque led a an Urban Direction Finding (UDF) training exercise.

An urban direction finding team is comprised of two or more people equipped with direction finding gear and a vehicle. Locating accidentally

activated emergency locator transmitters is the most common mission.



Major Bourque teaching a UDF skill to cadets Regan an Robertson.

Maj Farley, Capt. Schmidt, Lt Regan and cadets C/MSgt Regan and C/TSgt Robertson completed the first stage of UDF training.

Thames River Composite Squadron
Minutes
19 November, 2024

The Squadron engaged with Wing in the periodic Subordinate Unit Inspection.

C/CMSgt Balfour briefed the cadets on the first untethered flight of the Australian Vertiia eVTOL aircraft. The vehicles energy is stored in electric cells but there are plans for converting to hydrogen fuel cells.

Capt Capt. Deignan Schmidt gave a CD lesson on "respectful disagreement."

Five cadets were promoted.

(L-R) Grant Scroggins, Wright Brothers award, Garrett Scroggins, Eddie Rickenbacker award, Thelma Grogan displays her long awaited Mitchell Certificate, James Robertson, Eddie Rickenbacker award and Shane King, the Lindbergh Award.

TRCS has been awarded the Quality Cadet Unit Award for the 9th consecutive year. Criteria for the QCUA required meeting six out of ten objectives for cadet activities such as encampment attendance, orientation flight participation, promotions, emergency service qualifications, aerospace excellence programs and participation in enrichment activities such as STEM.

C/2d Lt Thelma Grogan has accepted an appointment to the U.S. Naval Academy, Annapolis, Maryland.

The future Midshipman receiving her C/2dLt epaulettes from Mr. and Mrs. Grogan,

Cadet Grogan is qualified in emergency services, communications has attended two encampments and earned an achievement ribbon.

LT COL ART DAMMERS RETIRES

Lt Col Art Dammers has retired after 15 years in the CTWG and five in the NCWG.

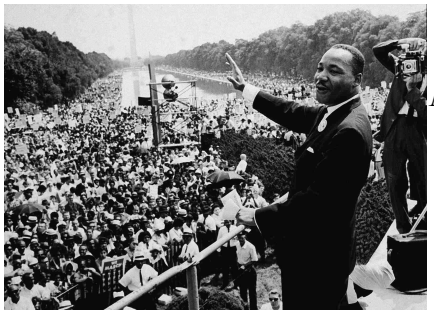
While at CTWG, he worked as the Internal AEO for the Director of Aerospace Activity and provided invaluable support to our aerospace activities such as the Annual Commanders Cup Rocket contests and field trips to Washington, D.C., the USS Intrepid Sea, Air and Space museum, and Old Rhinebeck Aerodrome.

103rd Composite Squadron-2009 Commander Cup Rocket Contest

Art at Bolling AFB preparing to take pictures of cadets on a Washington field trip.

COMMONPLACE BOOK

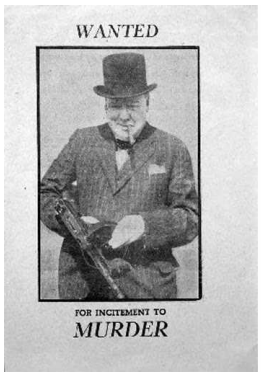
More Quotes to Enrich Your Lives



Martin Luther King, Civil Rights Warrior

I have a dream that my four little children will one day live in a nation where they will not be judged by the color of their skin but by the content of their character.

Sir Winston Leonard Spencer Churchill



Nazi Propaganda Poster

So we must beware of a tyranny of opinion which tries to make only one side of a question the one which may be heard. Everyone is in favour of free speech. Hardly a day passes without its being extolled, but some people's idea of it is that they are free to say what they like, but if anyone says anything back, that is an outrage.

Margaret Hilda Thatcher, Baroness Thatcher, Prime Minister of the United Kingdom

America, my friends, is the only country in the world actually founded on liberty - the only one. People went to America to be free.

Chuck Yeager, Aviator

Rules are made for people who aren't willing to make up their own.