Missions for America
Semper vigilans!

Semper volans!

Publication of the Thames River Composite Squadron
Connecticut Wing, Civil Air Patrol
http://ct075.org.
300 Tower Rd., Groton, CT

Issue 17.21 20 June, 2023

Lt Col Stephen Rocketto Editor
1st Lt David Pineau, Publisher
Maj Roy Bourque, Paparazzo
2d Lt Joanne Richards, PAO
C/2dLt Stephen Buchko, Cadet AEO
C/SSgt Lucas Dellacono, Cadet PAO
C/SrA Adam Balfour, Cadet Ass't. PAO
Capt Edward Miller, Features
Maj Scott Farley, Roving Correspondent
Shawn Terry, Automated Sciences, IT Guru

24 JUN-Airman Into Academy
04 JUL-Groton Independence Day Parade
13-16 JUL-North Stonington Fair
14 JUL-Military App. Night-Dodd Stadium
29 JUL-06 Aug-CTWG Encampment
19 AUG-Connecticut Aviation Day-GON
09 SEP-Touch-A-Truck-East Lyme
15-17 SEP-CTWG Conference
21-24 SEP-Durham Fair Parking Detail
23 SEP-Scarecrow Festival-Preston

CADET MEETINGS

20 June, 2023
submitted by
Capt Stephen Schmidt

Cadets met at the Groton-New London Airport for drill practice and testing. They then returned to squadron for the raising of the colors followed by an aerospace current events briefing by C/2Lt Buchko on the aircraft present at the recent 100th Italian Air Force Anniversary Airshow. This was followed by a leadership lesson on servant leadership by C/Lt Col Bosse. C/1Lt Schaffer then delivered a briefing on his experience at the Naval Academy Summer Seminar. The meeting then closed with a review of upcoming events and the retiring of the colors.

SENIOR MEETING

20 June, 2023
Squadron Maintenance Work Party
submitted by
Maj Scott Farley

Many hands make light work. Eight senior members tackled the scraping and painting of the trailer "skirts" on the cadet trailer. The wooden skirts were heavily weathered after initial installation 5 years ago The crew consisted of Roy Bourque, Sparky Doucette, Scott Farley, Alex Knets, Mike Kopycienski, Keith Neilson, Jason Otrin, and Steve Schmidt.

Capt. Kopycienski who spearheaded the effort in obtaining the needed supplies and equipment. There is left over paint so there will another effort to put on a second coat. Standby for your invitation to join the next work party.

AEROSPACE CHRONOLOGY FOR THE WEEK

June 21, 1985 – Sweden enjoys it first aircraft hijacking. A drunk loser name Stein Arvid Huseby armed, appropriately enough with an air gun, takes over Braathens SAFE Flight 139 en-route to Oslo from Trondheim.

The early 737s with wingspans about equal to length were known as "Fat Alberts."
(Credit: Michael Gillian)

He demands to make a statement to Swedish Prime Minister Kåre Willoch and Minster of Justice Mona Røkke. He was upset about his treatment after his release from prison. An alcoholic with five convictions for violent offenses, he wanted guarantees for a better treatment and economic security from the authorities. During the entire time aboard, he continued to drink until the aircraft ran out of beer. He then negotiated to surrender his air gun form more beer. He did so and was taken into custody and eventually sentenced to three years prison time and five years of preventive supervision.

June 22, 1962: The last of 744 Boeing B-52 Stratofortresses B-52H-175-BW, serial number 61-0040, is rolled out at the Boeing Company plant in Wichita, Kansas. It is currently assigned to the 23rd Bomb Squadron and carries the name *Spirit of Minot*.

Then and Now

June 23, 1942– First flight of the Martin JRM Mars. The flying boat was conceived as a maritime patrol aircraft to follow up the PBM Mariner. The prototype designated XPB2M-1 Mars was converted to a transport configuration, became known as the *"Old Lady"* and flew throughout the war as a utility aircraft and crew trainer until being scrapped in 1945.

The Prototype Mars

The Navy was satisfied with the performance of the aircraft but only ordered six more, the *Hawaii Mars*, *Marianas Mars*, *Philippine Mars*, *Marshall Mars*, *Caroline Mars*, *Hawaii Mars II.* They were delivered in 1945-46 and never saw wartime service.

Caroline Mars in Navy Service

In 1945, The original *Hawaii Mars* sank in Chesapeake Bay after a failure of the vertical stabilizer led to loss of control and severe porpoising. *The Philippine Mars, Marianas Mars, Caroline Mars* and *Hawaii Mars II* were sold to Canadian interests and converted to water bombers for fighting forest fires. In 1961, the Marianas Mars crashed into a mountain when her water drop mechanism may have failed and compromised its climbing performance. That same year, *Caroline Mars* was damaged beyond repair by Typhoon

Freida. The *Marshall Mars* sank off Diamond Head, Oahu after an inflight engine fire and emergency landing.

The two survivors, *Hawaii Mars II* and *Philippine Mars are owned by Coulson Aviation and* are based on Sproat Lake in British Columbia.

Philippine Mars in the Coulson Livery Beached at Sprott Lake

At one point, negotiations were underway to ferry the Philippine Mars to the Museum of Naval Aviation in Pensacola but political issues involving both the Canadian and U.S. governments seems to have ended that possibility. There is little possibility that either aircraft will ever again fly as water bombers and their futures are uncertain.

June 24, 1952 – The first of two prototypes of Convair's YB-60 jet bomber suffered rudder damage due to flutter during a test flight. The replacement was the rudder from the number 2 prototype.

The heritage of the B-36 is evident. Convair used much of the B-36 technology and construction apparatus to save money in the YB-60 development.

However, Convair's ambition to replace its B-36 as the new United States strategic bomber was crushed when the superior Boeing B-52 was chosen. Both prototypes were salvaged for useful parts and then scrapped

June 25, 1944 – First Flight of the "composite" powered Ryan FR Fireball, using both a turbojet and piston driven propeller. The Navy investigated the composite power arrangement for two reasons. The low power ratings of the first jet engines were barely adequate and they were also slow to "spool up" when the throttle was retarded as when on final approach. This made accomplishing a successful missed approach a chancy maneuver.

Two other composite powered aircraft were also built, the Curtiss XF-15C and the Douglas XF-2R Skyshark but neither made it past the prototype stage and the newer more powerful turbines were coming on line so the idea was dropped.

June 26, 1912 – Proof that crashing your airplane may not end your flying career. 2nd Lt. Henry H. Arnold, holder of Military Aviator Certificate No. 2 was attempting to fly from Plymouth, Massachusetts to a military base on the Housatonic River in Connecticut. When taking off, he dipped the wing of his Burgess Type H hydroplane into Plymouth Bay writing off the aircraft.

Surviving with a scar on his chin and a developing fear of flying, he went on to become General Hap Arnold, USA and General Hap Arnold, USAF, the only man to hold the five-star rank in to U.S. military services.

June 27, 1909 – The New York Times, Sun and the Herald carried ads for sale of aircraft to the general public.

Wyckoff, Church & Partridge

ANNOUNCE

The First actual building and selling of Aeroplanes which are practical in flight, and which can be delivered to the purchaser within FORTY DAYS from date of order.

THE HERRING-CURTISS AEROPLANE IN FLIGHT.

¶ We have arranged with the manufacturers for the construction and sale of the

HERRING-CURTISS AEROPLANE,

a machine for air navigation, pronounced by competent authorities to be the most compact, practicable and efficient Aeroplane for the use of the amateur.

OUR FIRST SALE

Within 24 hours from the making of our arrangements with the builders, the FIRST SALE was made to Mr. A. P. Warner, Vice President of the Warner Instrument Co.

¶ The HERRING-CURTISS Aeroplanes are the outcome of the combined thought and skill of the two most prominent and successful scientists in the aviation field. Mr. A. M. Herring and Mr. Glenn S. Curtiss. Mr. Herring's work dates back to the very beginning of experiments with heavier-than-air machines. His use of the Bi-Plane antedates the work of all other men who have contributed to the science of aeronautics. Mr. Herring also enjoys the distinction of being the first human being to navigate the air in a self-propelled heavier-than-air machine.

We have established an aviation department, and solicit a hearing from those interested in the purchase of an aeroplane.

We are prepared to arrange for convincing demonstrations of the utility of the HERRING-CURTISS MACHINE, and to quote prices for early delivery.

Aviation Department,
Wyckoff, Church & Partridge,
1,743 Broadway, at 56th Street.

FEATURE ARTICLE

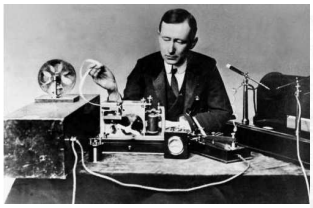
A Brief History of Signal Intelligence
by
Shawn Terry

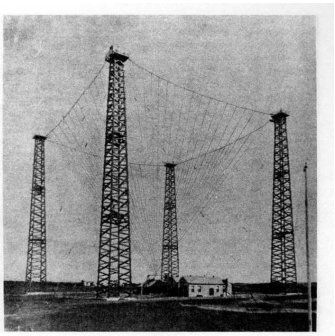
Part I

Signal Intelligence refers to the ability to intercept and understand information sent between two or more parties. Before the advent of electronic technology, signaling used a variety of devices: drums, semaphores, heliographs and telegraphs to name just four. However, I am going to jump ahead to the early 20th century when for the first time signals could be transmitted between two points hundreds of miles apart instantly and without any physical connection between them.

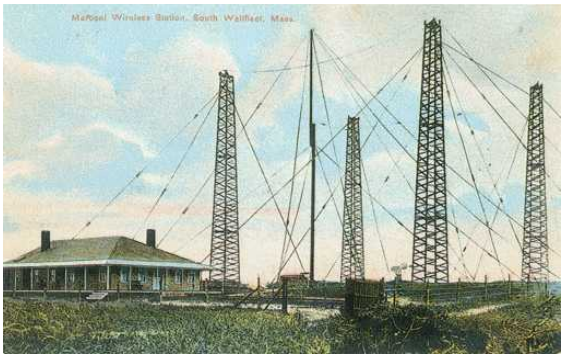
The First Radio Transmissions

In 1894, Guglielmo Marconi used Heinrich Hertz's discovery that electromagnet interactions could generate "waves" which could be transmitted between two points without wires and these waves could be manipulated to contain information. This British Post Office recognized the possibilities inherent in this new technology and supported his work.





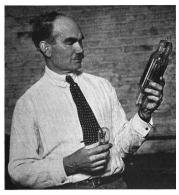
Marconi station at Poldhu, Cornwall, England, about 1905. The four wooden towers support a network of wires which converge to a point just above the transmitting and receiving buildings between the towers.



In 1889, he succeeded in sending Morse signals across the English Channel. Two years later, Marconi managed to send an intelligible signal 2,100 miles from Cornwall to Newfoundland, the first trans-Atlantic radio message.

The Invention of the Triode

Marconi's equipment used spark-gap technology and had limits in its ability to develop enough energy to send legible signals long distance was limited. But in 1906, Lee DeForest created a vacuum tube containing three electrodes which became known as the triode.



Lee DeForest and a triode.

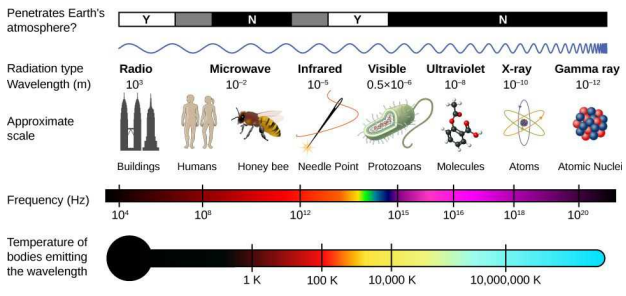
It could amplify the signal at audio and radio frequencies and made radio wave transmission practical. This invention was rapidly improved and by the time of World War I triodes that could transmit radio waves at a single frequency with hundreds of watts of power at at 3-30Mhz were in use and which allowed for efficient antennas to be used.

On the receiving side triode amplifiers boosted very weak signals to the level where they could drive a speaker or drive actuators to type a message. This technology also met that voice could easily be used allowing more ease of use, faster messages, and interactive conversation. Military organizations around the world quickly adopted this technology.

Types of Radio Transmissions

Low Frequency (<2MHz) mostly propagates as a surface wave and is typically inefficient due to the large antenna size needed for optimal efficiency.And since bandwidth, the amount of information which can be sent is proportional to the frequency, the data rate is very low. But since the wavelength is so long, the signals can diffract around large objects, such a mountain ranges, which would block higher frequencies.

High frequency (3-30MHz), propagates by bouncing off the ionosphere. With sufficient power and favorable atmospheric conditions signals can travel for thousands of miles, even if the transmitting party does not desire such a range.



However, they tend to be noisy.

For signal intelligence this means that HF broadcasts could be received from hundreds to thousands of miles away making it ideal for command and control applications. In fact HF radio was used by every navy throughout the world as the primary means of communication for most of the 20th century. However it also made these transmissions easy to intercept since how far a signal would travel was not predictable. This meant that the chance of interception increased as greater range increased the footprint of the signal.

Frequencies over 50MHz are typically referred to as Very High Frequency (VHF), Ultra High Frequency (UHF) and Microwaves (MW). These frequencies are strictly line-of-sight, unlike HF, and are limited to the distance from the transmitter

to the horizon. A useful approximation of the line of sight distance is $d \approx 1.23\sqrt{h}$ where 'd' represents the line of sight distance in statute miles and 'h' is the height of the antenna in feet.

The higher frequencies offer other advantages. Antennas can be smaller and directional and bandwidth is greater. Since range is limited, commercial broadcast stations like FM radio and television can reuse the same frequencies when spaced far enough apart.

One common frequency, 122.8 MHz is part of a set of eight frequencies dedicated to the Unicom system familiar to all pilots. Stations are spaced relatively far apart and may use one of the eight available frequencies but when operating at altitude, a pilot may hear transmissions to and from a number of different airports.

Radio Broadcasts

From the birth of commercial radio up to a few years ago national military and diplomatic corps desired to know what the media were saying in a country. In countries with democratic governments, newspapers were commonly used to gain such information. Listen to the radio news or buy newspapers or political journals, summarize

anything important and forward it by either coded radio or telegraph or diplomatic bag.

Listening to military or diplomatic transmissions was generally done by special intercept stations located on military bases. Radio transmissions were either at VHF/UHF frequencies with a line of sight limitation or broadcast AM that is mostly a surface wave and generally limited by power used to about a hundred mile range. Prior to and during WWII most of this was done by the United States and United Kingdom from intercept stations where intelligence analysts were usually directly listening to the available broadcasts. For example, the United States Navy, Great Britain and Australia had major intercept stations at Pearl Harbor, Hong Kong and Melbourne.

After WWII and with the shift to more television and FM radio broadcasts, basically within the VHF band, much more of this was done from aircraft and ships that could linger for for long periods of time just outside of territorial boundaries. Aircraft were more effective at this role as they greatly enhanced receiving range. The line of sight went from about fifty miles assuming 500 ft high transmitter tower and a 50 ft high ship based receiving antenna to 200 miles if the is aircraft flying at 30,000 feet. This type of signal intelligence was almost exclusively done by the USA and UK. During the Cold War, at least 40 U.S. intelligence aircraft were shot down and approximately 200 crewmen lost.

In the 1950's, the Soviets introduced their “fishing trawlers” which was a rather advanced signal intelligence platform disguised as an innocent looking fishing vessel. It provided an inexpensive way for the Soviets to gain intelligence especially from weapons tests, submarine operations, tactical methods.

Soviet “fishing trawlers” were often noted cruising international waters off-shore from U.S. submarine bases and near NATO tactical exercises. The United States, Great Britain and Australia maintain a world-wide chain or ground intercept stations and airbases for the same purpose.

Satellites are even more effective. The joint U.S-Australian intercept station at Pine Gap near Alice Springs uses satellite technology to cover the entire Asia-Pacific region.

Pine Gap

With most military communications being HF and with HF radio transmissions being easy to intercept at distances of hundreds to thousands of miles away meant that it was likely an adversary was listening to these transmissions so stopping them from getting an exploitable signal was technically difficult.

The traditional method to make a signal unintelligible to an eavesdropper is to either code or cipher the message. A code is a system of substituting elements of the message for symbols or alternate words. In the familiar Morse code, the letter “R” is replaced by dot-dash-dot. Telegraph companies would charge by the word so businesses used one of a number of standard substitutions. In one system, “Queerness” would stand for the phrase “referring to telephone communication of today” and “Byoxo” meant "Are you trying to weasel out of our deal?" These business codes were listed in various books mostly aligned to a specific industry and were openly available. Codes could also be secret.

On the other hand, a cipher is a system in which the letters in the original message are rearranged or changed. The legendary Enigma machine did this by an electro-mechanical process which substituting letters according to a prearranged key and then shifting the letters used after each key entry. The intent is to guarantee secrecy.

The Enigma machine shown above is loaded with three rotors but later machines could use for of them at one time. In addition, an additional set of rotors were available. Just below the rotors are the lamps, one for each letter. The keyboard is fairly close to the standard "qwerty" keyboard found on most typewriter and computer keyboards. The plugboard found below was used to swap letters and added trillions of more possibilities to a coded message.

As a trivial example consider a code in which each letter in the message is replaced by the letter which appears after it in the alphabet. So "token" becomes "uplfo." This is called a "Caesar Cipher" but could be varied by changing the number of letters shifted. Try decoding this message using a Caesar cipher.

JLYH PH OLEHUWB YU JLYH PH GHDWK

Some hints: A brute force attack trying one letter shifts at a time. A computer program would make this very fast.

Note repetitions. The coders failure to reduce the message to five letter blocks provides a crib into the decrypt.

Letter frequency. Which letters are most likely in English and which or them occur most frequently in the message. (Or is it in English?) A longer message would make this a better candidate for the letter frequency approach.

Solving part of the message will give you clues into the entire message.

A language is a form of code and is constructed by a set of rules of called syntax. The meaning of the constructs are then interpreted by semantical rules.

In World War II, the U.S. military used native Americans who spoke languages that were not similar to European or Asian languages and that only tribal members knew. The use of Navajo "code-talkers" was depicted in a Hollywood movie. Navajo is not even a written language so it is unfathomable to those who are not member of the tribe.

Interestingly, the Navaho language did not contain sufficient words to convey the concepts of modern military apparatus so that judicious substitutions had to be made to allow the transmission of words such a "submarine" and "tank." For example, a dive bomber was *gini*, the Navajo word for chicken hawk.

Little known is the fact that a number of other languages were used to encrypt messages including Mohawk and Seminole by the U.S.military, Cree by the Canadians, Nubian by the Egyptians and Hungarian by the Ukrainians in the present Moscow-Kyiv unpleasantness.

Part II will follow in a future issue.