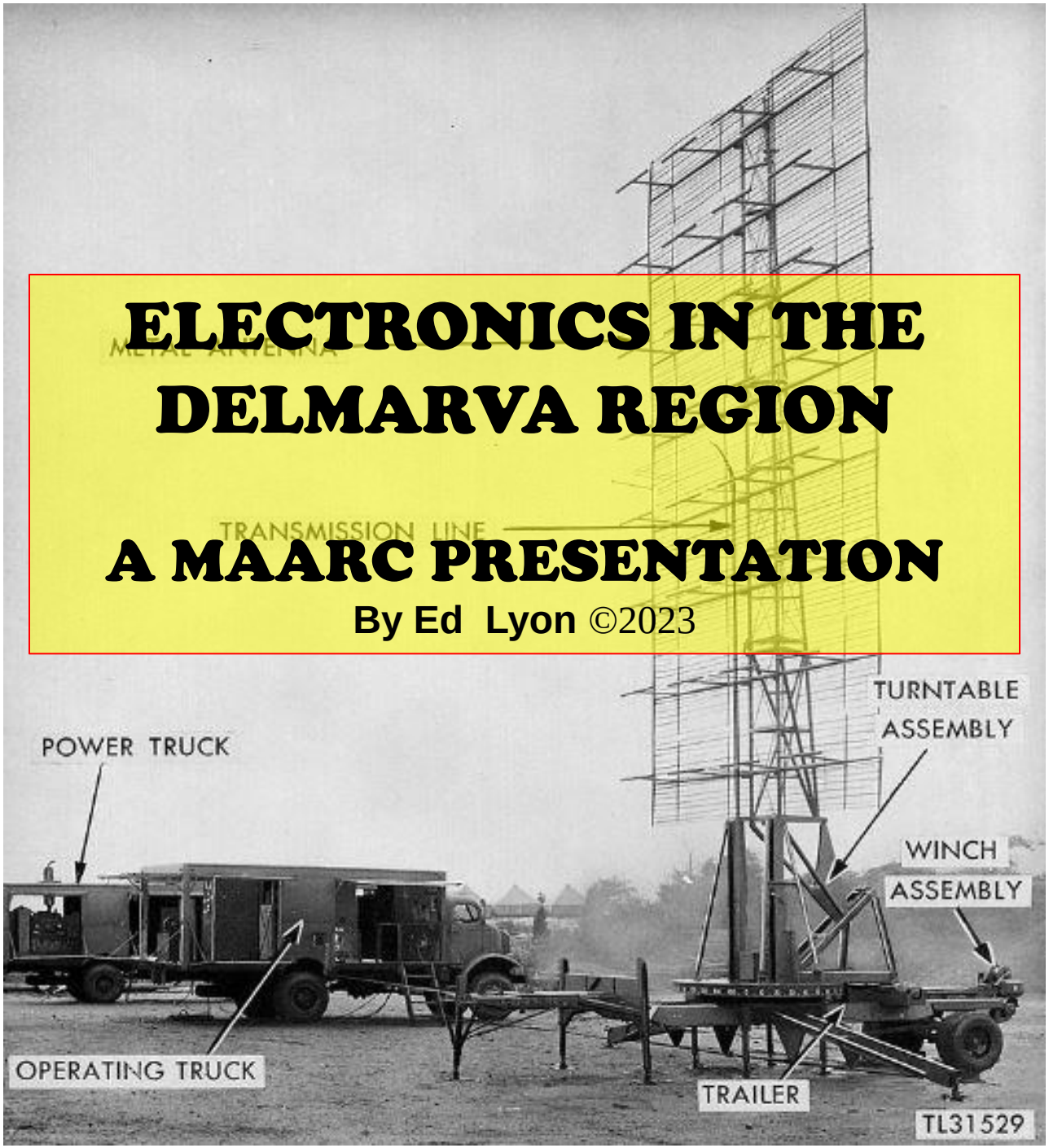


ELECTRONICS IN THE DELMARVA REGION

A MAARC PRESENTATION

By Ed Lyon ©2023

The Delmarva Region

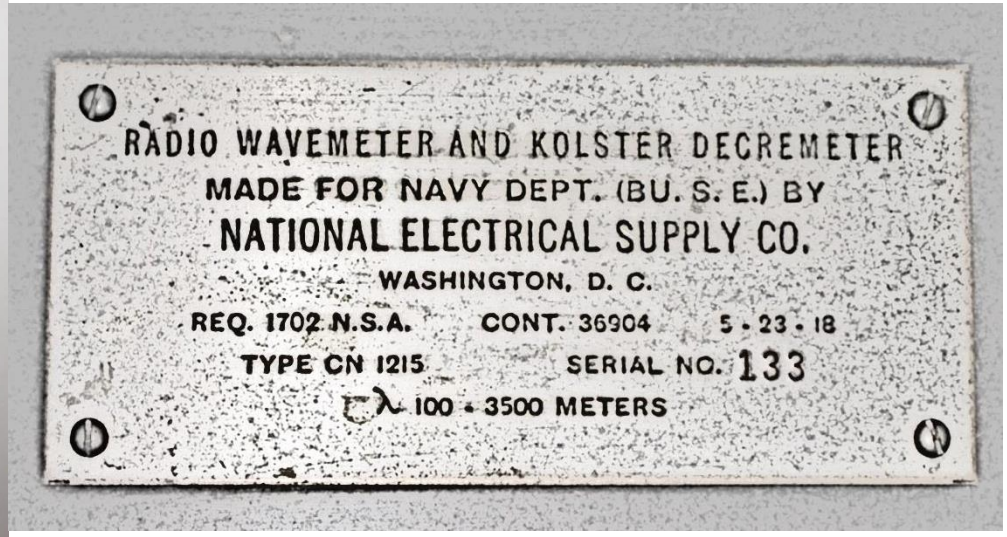
Although Silicon Valley, CA, and old Rte. 128 (now I-495) skirting Boston hosted many electronics firms, our Delmarva region was the birthplace and marketplace for significant electronics development and manufacturing. That industry began in 1905, and continues to the present.

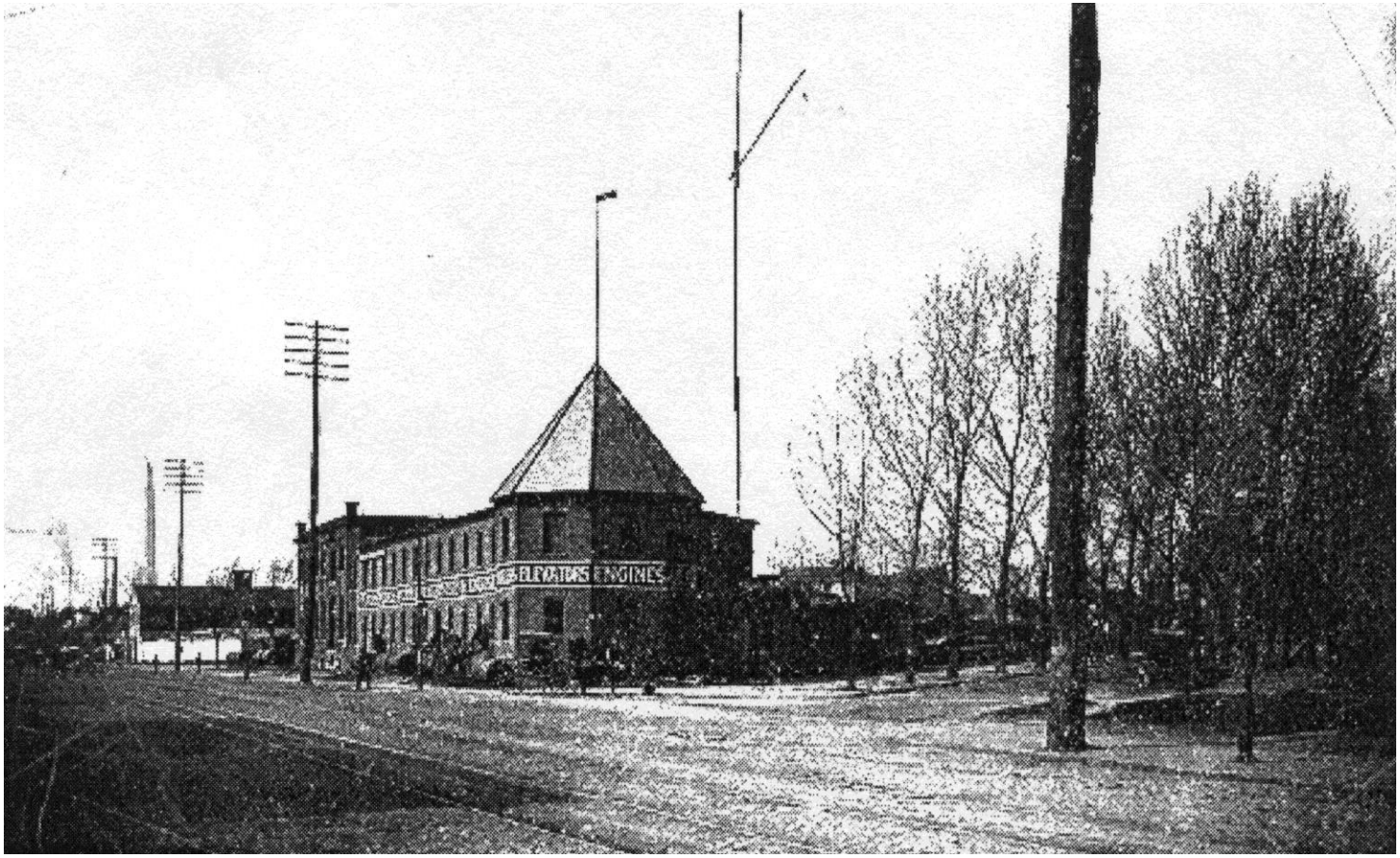
For example, National Electric Machine Shop (NEMS) began as the National Electric Supply Co. (NESCo) in 1905, in Washington, DC.

Many others began in WW2, started by smart engineers who had the entrepreneurial spirit and a variety of customers, mostly in the Federal Government.

Let's look at a few of these companies.

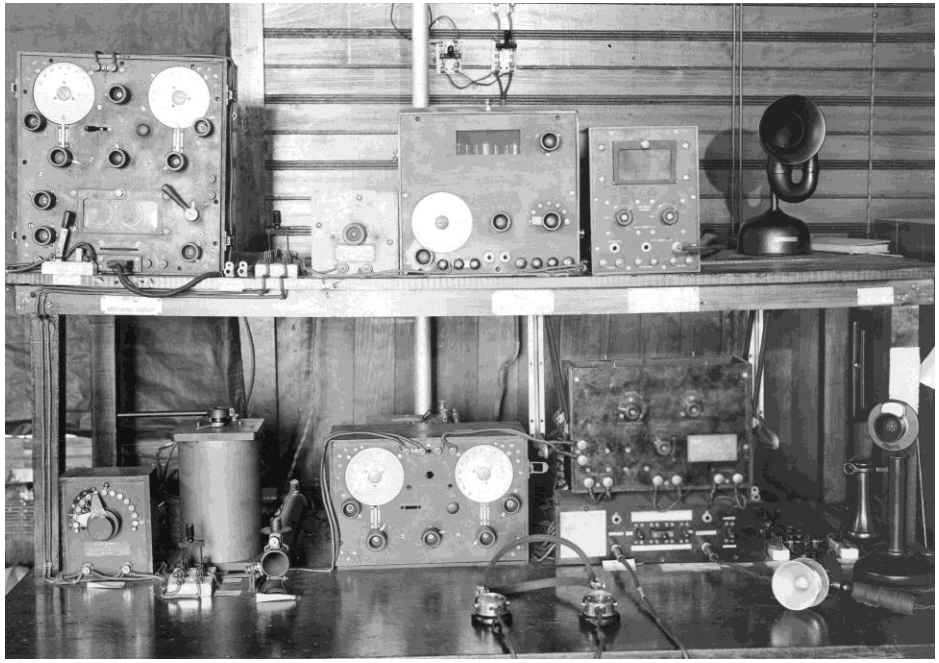
That National Electrical Supply Company (NESCo), became the workplace for Navy engineers needing a “prototype-shop,” a place to breadboard/test a new circuit. NESCo also produced Navy gear.





This is what NESCo looked like in 1909.
It was located at the corner of 7th and Water Streets NW .

The Navy had several major labs and test facilities in DC, Virginia, and Maryland, such as NRL, Naval Ordnance Lab, and the Naval Aircraft Lab. These labs produced prototypes of nearly all Navy equipment.



Typical NRL bench, all test gear NRL-made, in the 1930-1940 period.

NRL's Neutron counter, made for the Manhattan Project, 1942-44

Foremost of these labs was NRL, the Naval Research Lab, located in Anacostia, DC.

NRL's "Pat" Hyland and Leo Young, in the late 1920s, discovered radio reflections from airplanes flying over their radio experiments (RADAR!!). They obtained a patent on the idea of detecting unseen airplanes.

Admonished by Lab management, they formed a small effort outside of NRL, to pursue this research. They called the arrangement RADIO RESEARCH.

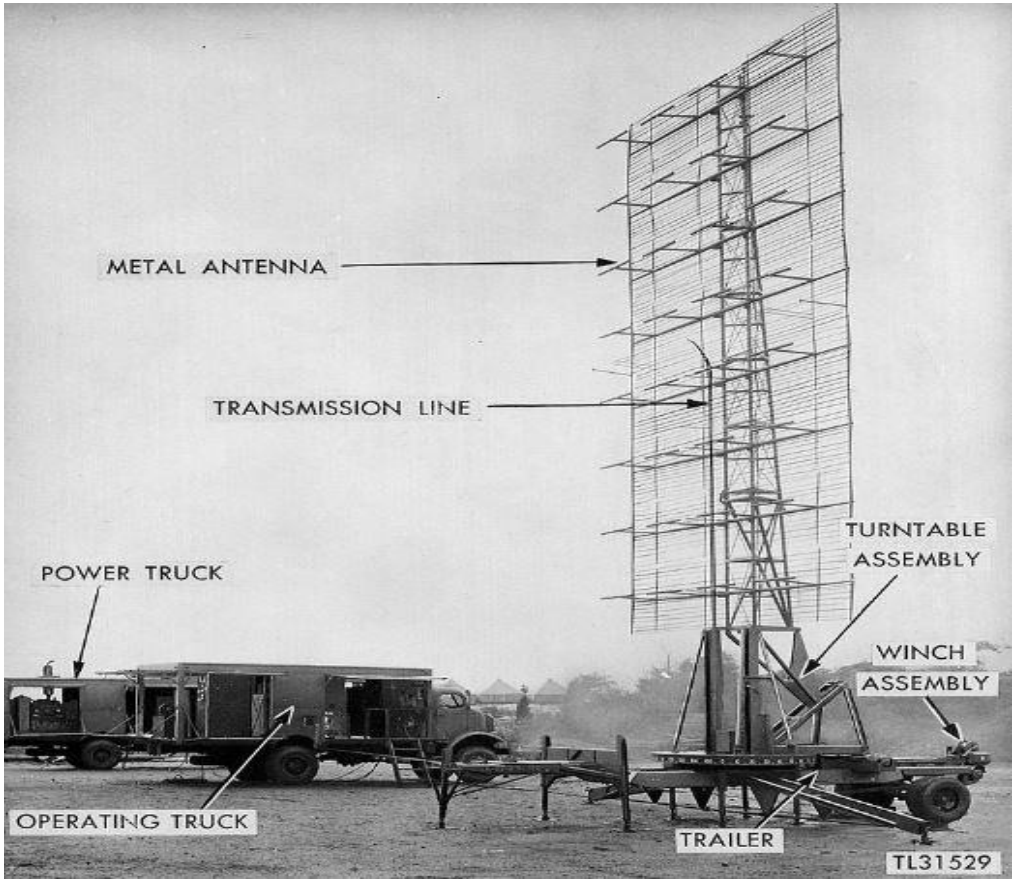
It was funded by inventions they sold to others, such as Hyland's airplane engine shielding idea, bought by Bendix Aviation in Chicago.

By 1933, however, Hyland and Young ran out of money, and "Radio Research," along with three other small operations, were bought by Bendix.

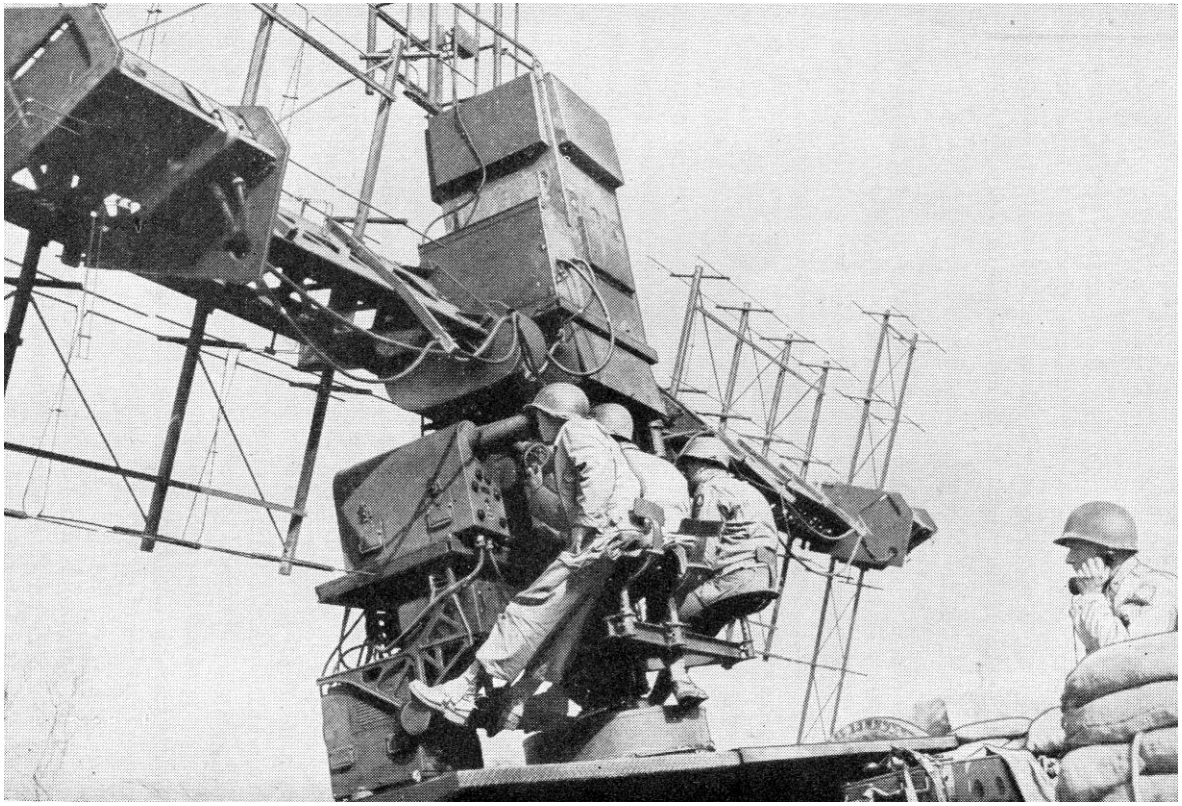
These small Bendix-owned groups were combined, and, in 1937 were re-located to Baltimore.

In 1938, the Radio Division of Westinghouse Electric Manufacturing Co. bought this Bendix group and moved the whole Westinghouse Radio Division from Pittsburgh and Massachusetts to the Baltimore facility.

In Baltimore, Westinghouse built radios and offered to construct the radars that the Army Signal Corps were struggling with, the SCR-270 and SCR 271. Westinghouse Baltimore ended up building hundreds of them, used throughout the war.



Westinghouse-Baltimore also built some of the SCR-268s

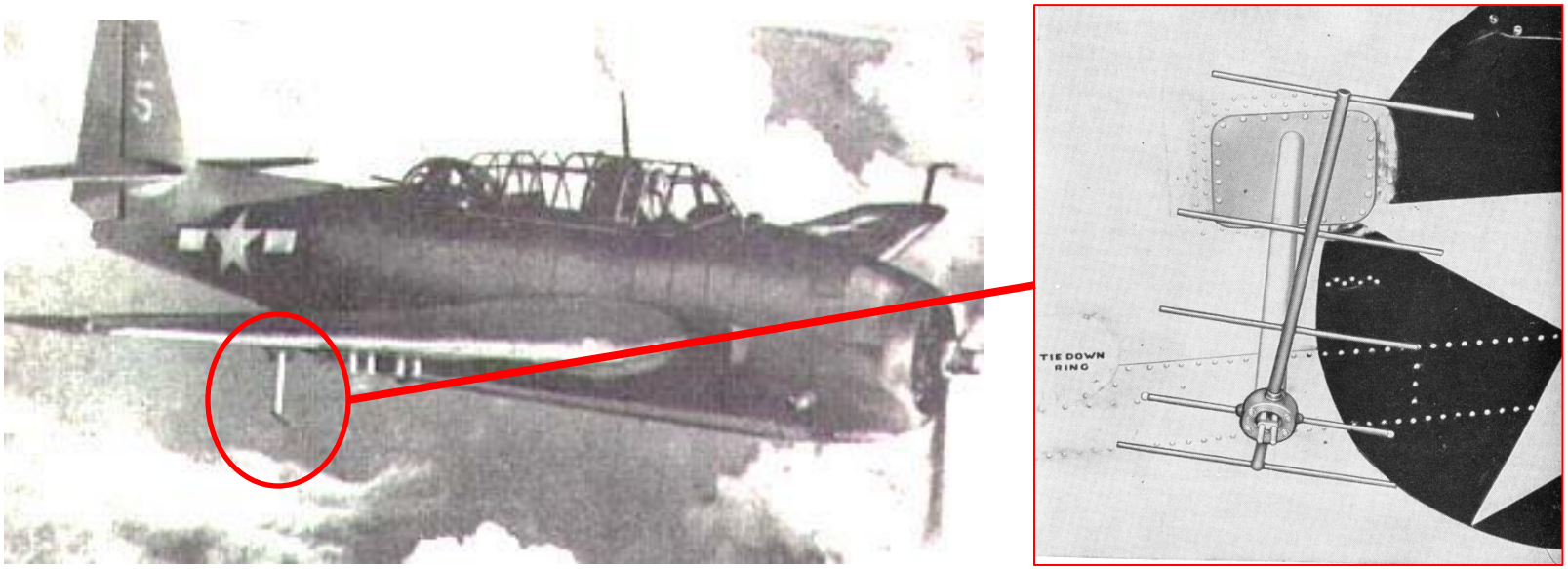


These were fire-control and searchlight-control radars.

Westinghouse also made some of the famous SCR-584 radars.

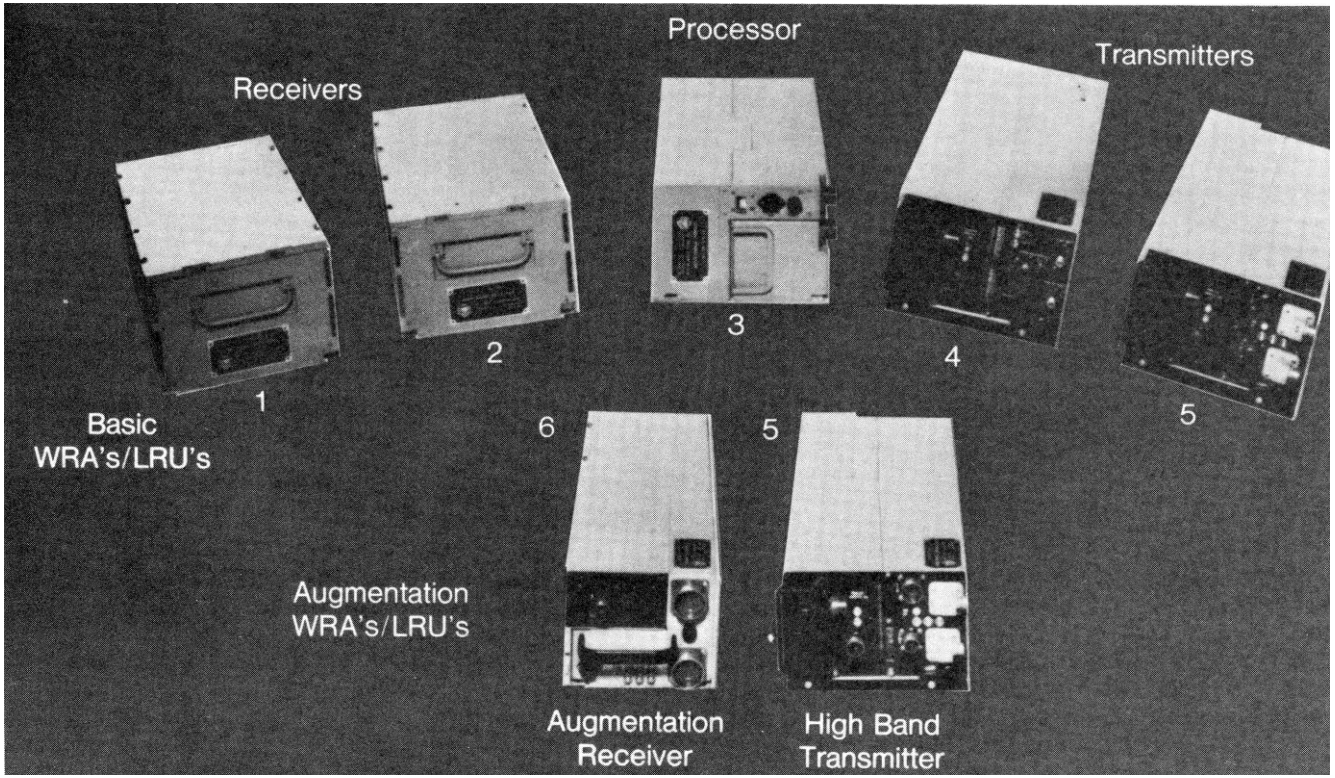
This radar, with its M-8 analog computer, and, connected to a 90mm AA Gun, destroyed 92 percent of the German V-1 Buzz Bombs it encountered.

And although the TBF aircraft was made in New York State



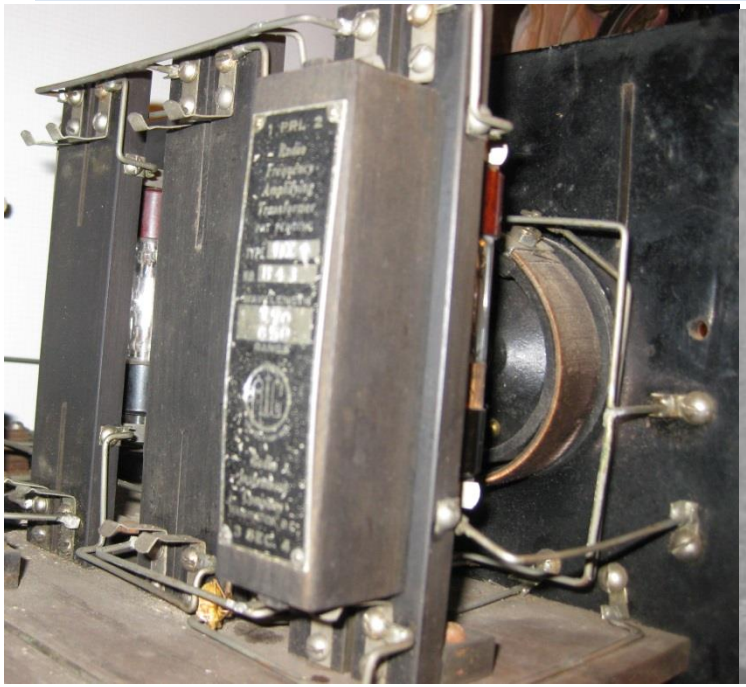
The radar (ASB-6) and antenna were made by Westinghouse; with it, the TBF located many of Germany's U-Boats in the last two years of WW2.

And, Westinghouse Baltimore also designed and built many cold-war radar and radio jammers as well



The Westinghouse facility is now home to Northrop-Grumman, foremost radar and electronics developer/producer today.

Aside from Navy shops, there were workers at the National Bureau of Standards who founded Radio Instrument Co. (RICo), in DC as a sidelight in the 1920s and 1930s:



Lowell-Dunmore (RICo) radio.

Daniels at a different RICo radio

Other RICo engineers assembled “VirBren-branded” kits for the home-production of long-box superheterodyne radio receivers.

This one had about five or six Lowell-Dunmore IF transformers in it.

Earlier, we mentioned NEMS (National Electric Machine Shops, Inc.), in Gaithersburg, which made many mechanical and electro-mechanical assemblies, including test equipment, for such firms as RCA, Westinghouse, and GE.

Typical of the NEMS-built instruments was the early RCA Voltohmyst vacuum-tube voltmeter/ohmmeter.

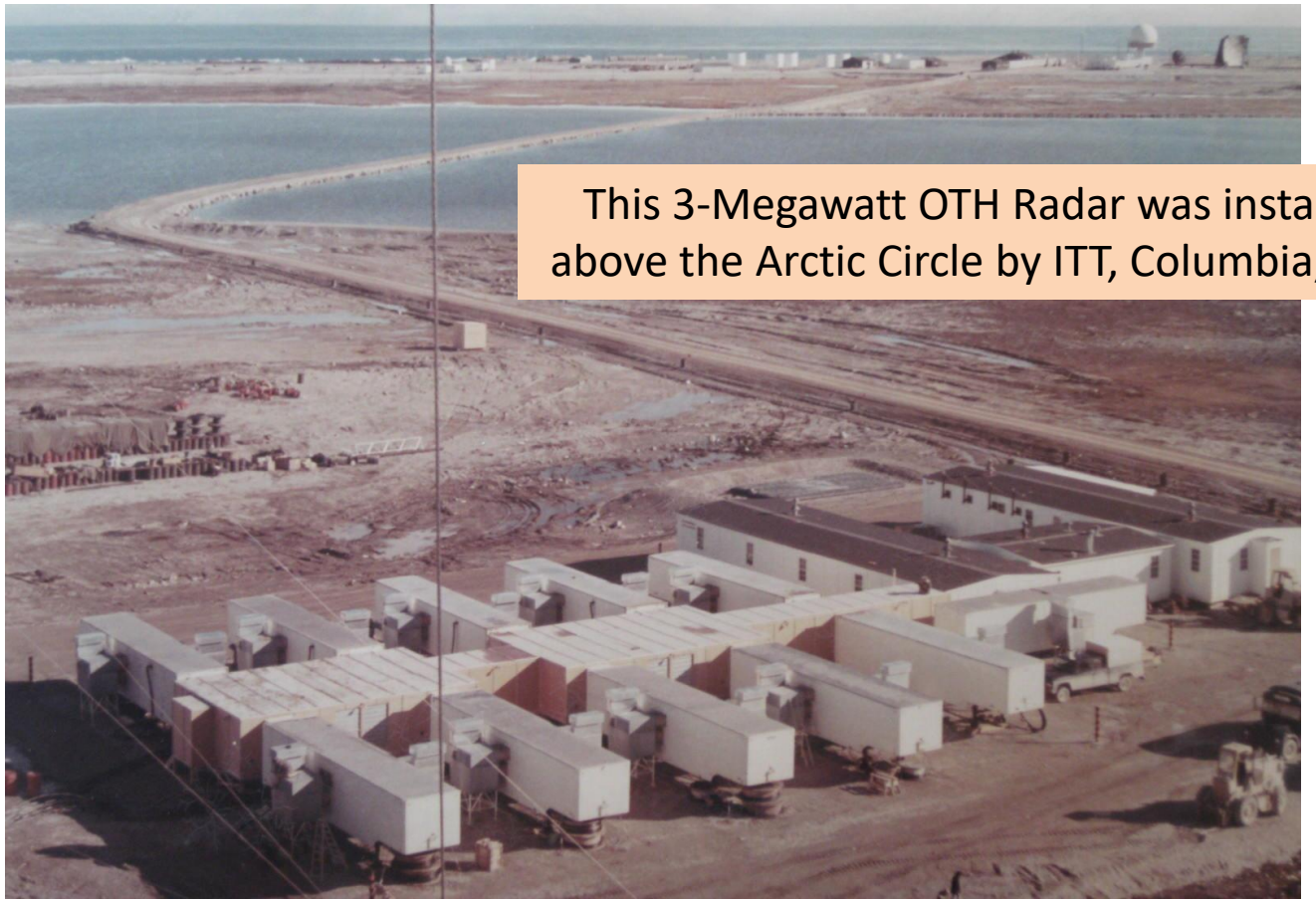
NEMS was joined by Allan Clarke's electronics shop, started on Jessup-Blair Drive in Silver Spring, MD, forming NEMS-Clarke, who made excellent "spook-receivers" treasured by NSA, CIA, NASA, and the military intelligence workers. Chief engineer was Ralph Grimm.

A large business-office building now stands on Jessup-Blair Drive

Nems-Clarke's Ralph Grimm left abruptly with a handful of excellent engineers when the company was bought and taken over by VITRO, in 1957. These fellows formed CEI (Communications Engineering Inc.) who made many early surveillance receivers.

One of NEMS-Clarke's receivers used by White Sands missile range

Meanwhile, in Riverdale, MD, Berliner's ERCO (aircraft designers/builders), having been bought by ACF Industries, was making Over-the-Horizon radars and was tinkering with Tinkertoys…… ERCO was bought by ACF and then by ITT by the mid-1960s.

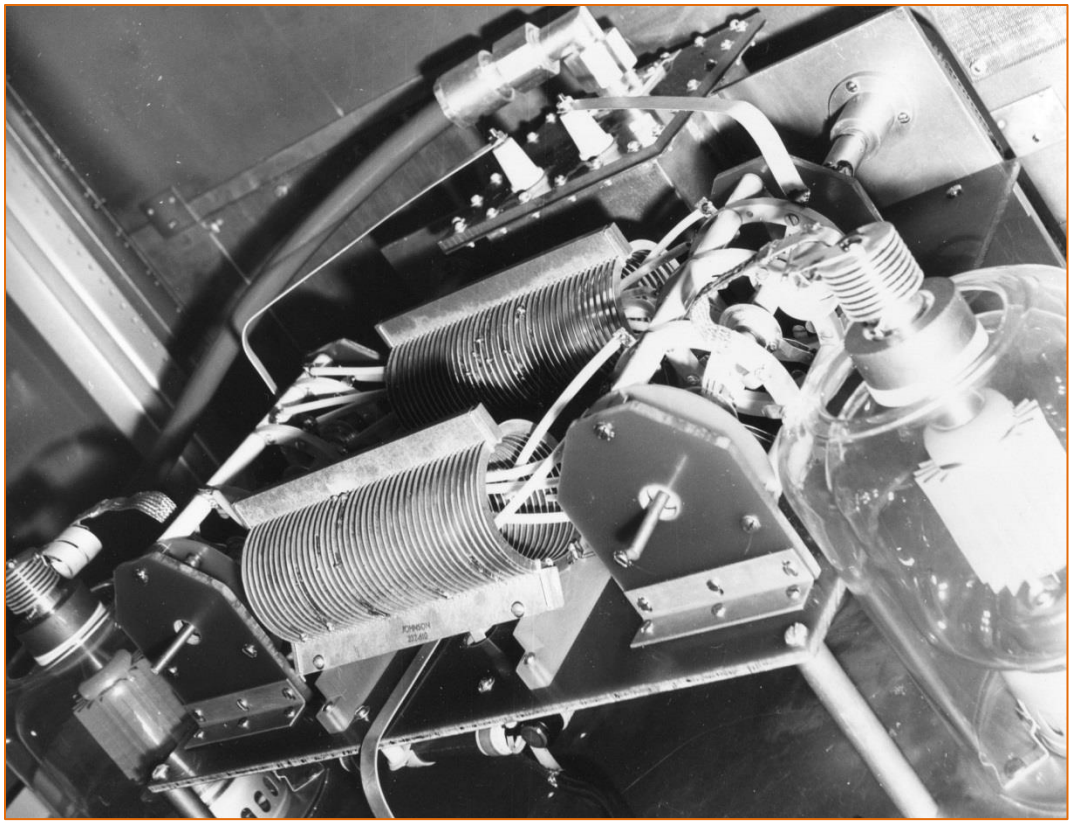


This 3-Megawatt OTH Radar was installed above the Arctic Circle by ITT, Columbia, MD.

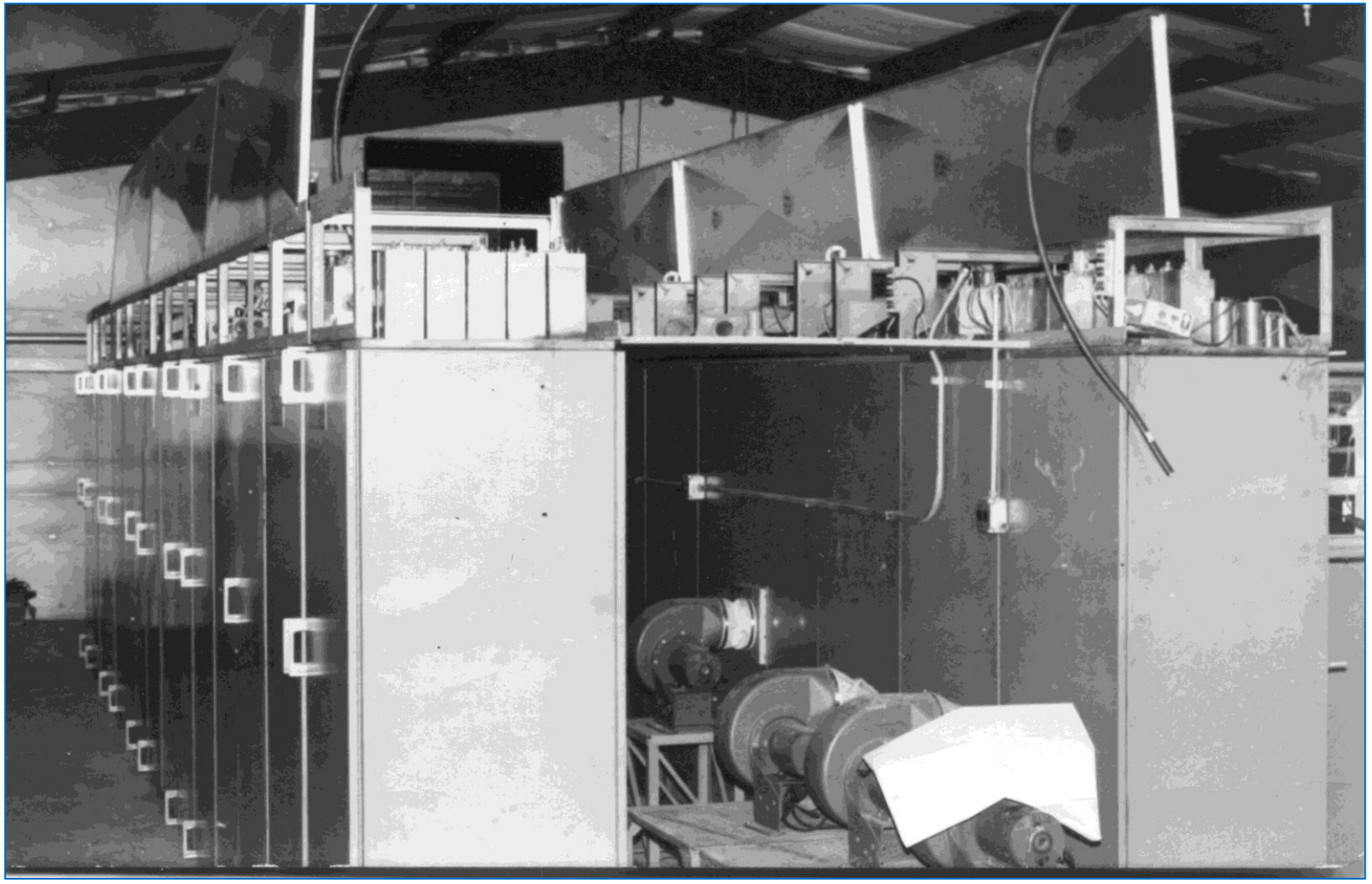
Other OTH radars were built by Erco/ACF/ITT in Bladensburg and Columbia, MD, and were installed in Taiwan, Libya, Pakistan, Puerto Rico, Hawaii, New Mexico, Alaska, England, Australia, Johnston Island, Eniwetok Island, and aboard an aircraft carrier, the *USS Core*.

This is the largest made by !TT-Columbia, (Picture taken from 200-ft. antenna tower (but at the 100-ft level!! Do you think I'm crazy??).

Since that radar operated in the shortwave radio bands, its array of 16 transmitters resembled over-size ham equipment. This is one of the low-level driver stages (push-pull Eimac 4-1000s).



The 16 transmitters filled about 2/3 of the pre-fab building at the site on Taiwan.

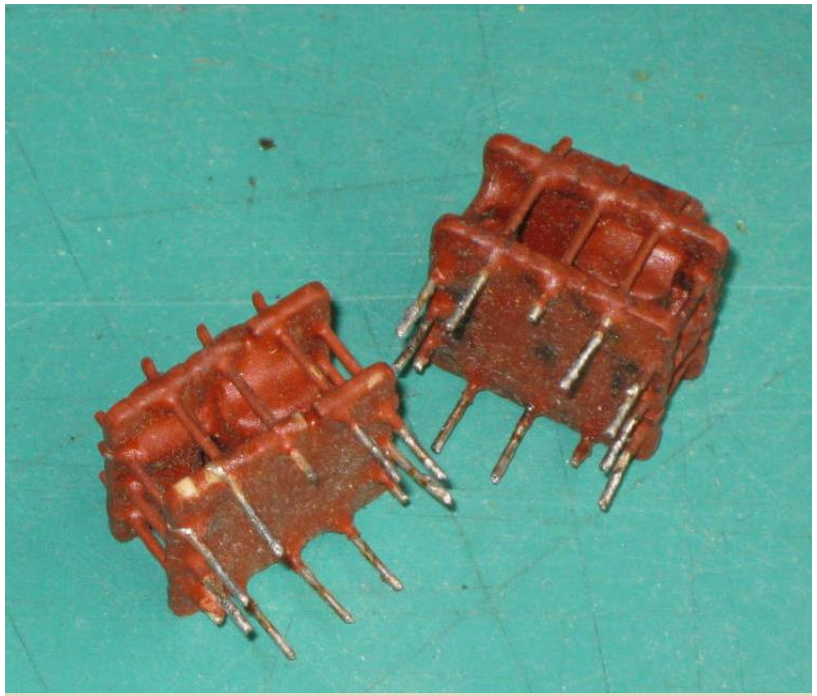


Of course a big radar like that would need electric power, so the radar contract included a power plant – 8 Caterpillar generators.

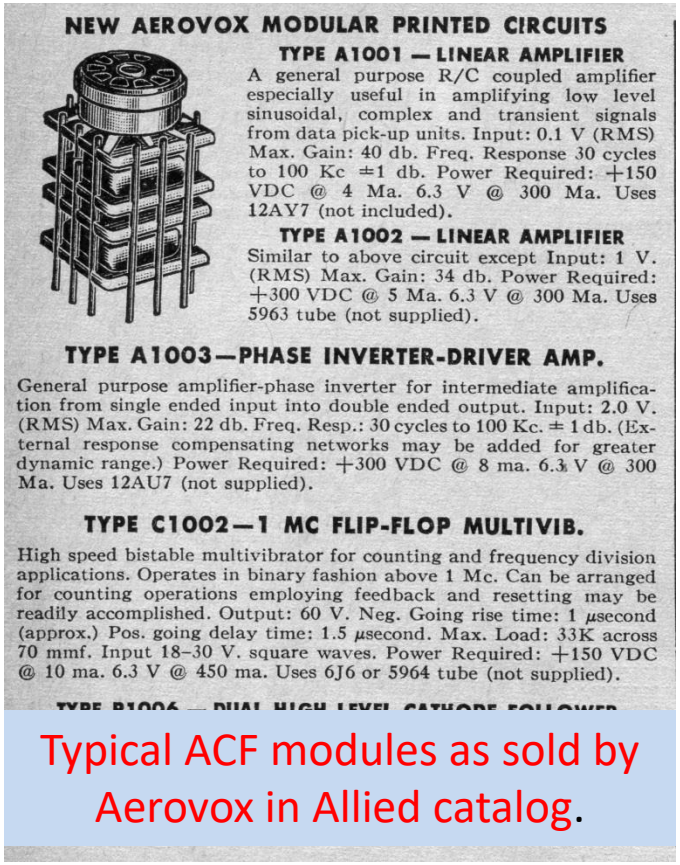
And those diesel engines needed fuel, so a fuel dump was built on site.

Three such tanks, 5000 gallons each, were built and emplaced by hand by a local Taiwanese subcontractor.

At the other end of the size scale were the Tinkertoys developed by the ACF Electronics folks, first at their Alexandria, VA shop, then at the ACF-EPL facility in Bladensburg, MD.



Typical ACF Tinkertoy integrated electronics modules, about 1960.



NEW AEROVOX MODULAR PRINTED CIRCUITS

TYPE A1001 — LINEAR AMPLIFIER

A general purpose R/C coupled amplifier especially useful in amplifying low level sinusoidal, complex and transient signals from data pick-up units. Input: 0.1 V (RMS) Max. Gain: 40 db. Freq. Response 30 cycles to 100 Kc ±1 db. Power Required: +150 VDC @ 4 Ma. 6.3 V @ 300 Ma. Uses 12AY7 (not included).

TYPE A1002 — LINEAR AMPLIFIER

Similar to above circuit except Input: 1 V. (RMS) Max. Gain: 34 db. Power Required: +300 VDC @ 5 Ma. 6.3 V @ 300 Ma. Uses 5963 tube (not supplied).

TYPE A1003—PHASE INVERTER-DRIVER AMP.

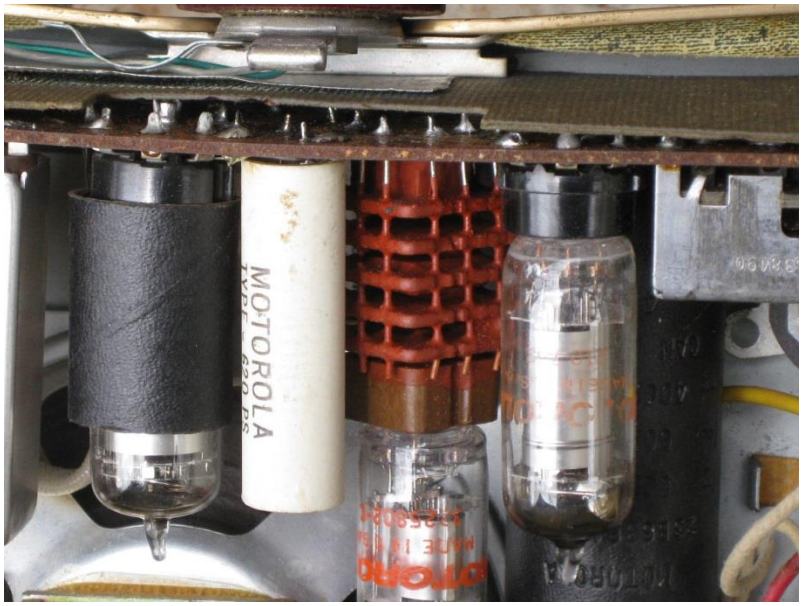
General purpose amplifier-phase inverter for intermediate amplification from single ended input into double ended output. Input: 2.0 V. (RMS) Max. Gain: 22 db. Freq. Resp.: 30 cycles to 100 Kc. ± 1 db. (External response compensating networks may be added for greater dynamic range.) Power Required: +300 VDC @ 8 ma. 6.3 V @ 300 Ma. Uses 12AU7 (not supplied).

TYPE C1002—1 MC FLIP-FLOP MULTIVIB.

High speed bistable multivibrator for counting and frequency division applications. Operates in binary fashion above 1 Mc. Can be arranged for counting operations employing feedback and resetting may be readily accomplished. Output: 60 V. Neg. Going rise time: 1 μsecond (approx.) Pos. going delay time: 1.5 μsecond. Max. Load: 33K across 70 mmf. Input 18–30 V. square waves. Power Required: +150 VDC @ 10 ma. 6.3 V @ 450 ma. Uses 6J6 or 5964 tube (not supplied).

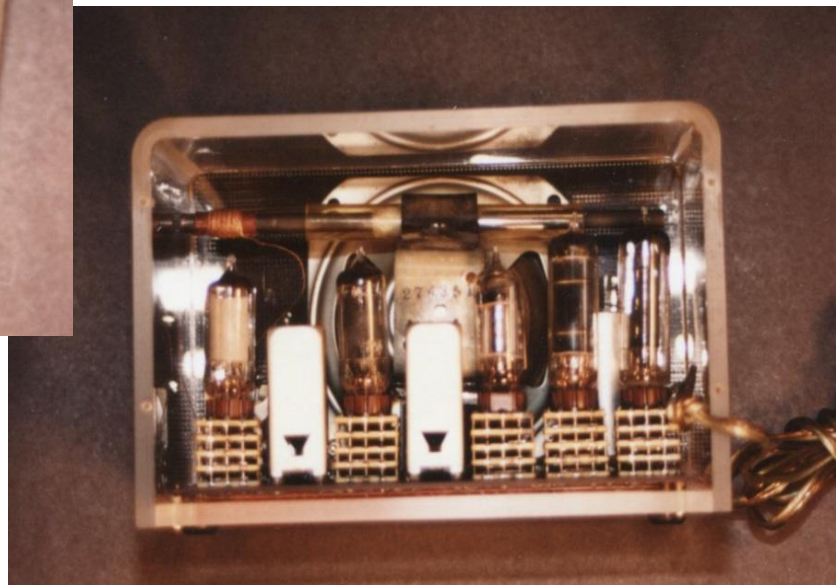
Typical ACF modules as sold by Aerovox in Allied catalog.

And Motorola made a radio that used one of these modules to replace all the audio amplifier components.



The Motorola 5P31A radio, and its inverted chassis, with the Tinkertoy module.

But ACF and the National Bureau of Standards each built complete radios containing 100% Tinkertoy modules as demonstrators. ACF also built a B&W TV set with them.



But most of the radio/electronics houses in our area were building superb receivers and signal processors for various Government agencies. This is a typical type, by Adams-Russell, (Micro-Tel Div.), Hunt Valley, MD.

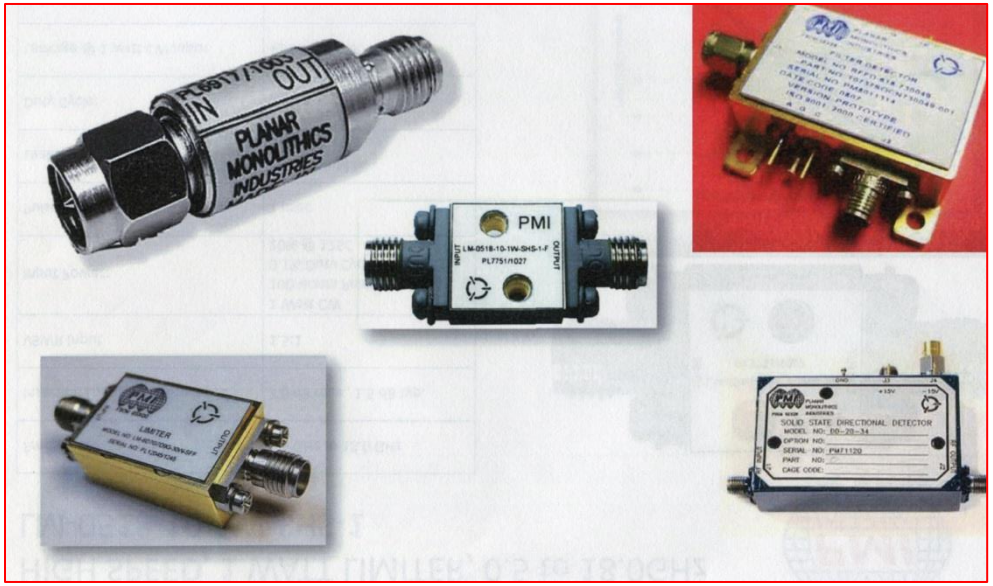
This is a CEI intercept receiver, made in Silver Spring, later improved by Watkins-Johnson, then in Gaithersburg, MD

These receivers were specialized for different uses for the customer Agencies:

- Telemetry Intercept (reading the flight data of missiles, aircraft, and drones).
- Electronic Support Measures, diagnosing radar and communications signals' characteristics.
- ELINT, SIGINT, and RADINT – intercepting signals, emitted both intentionally and accidently, for diagnosis.

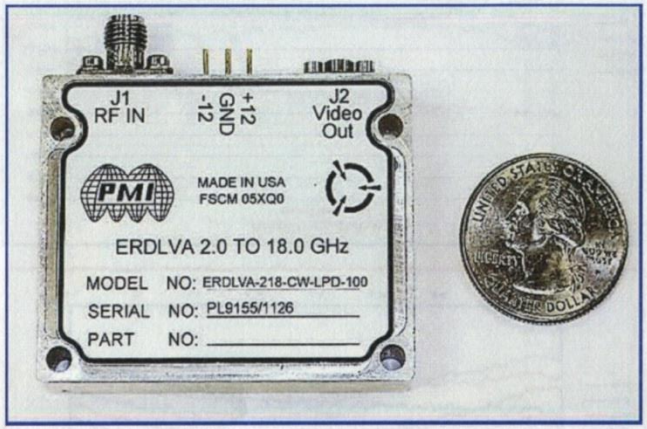
Such receivers were intended for use in aircraft, land vehicles, ships, laboratories, and, after 1963, in satellites, as well.

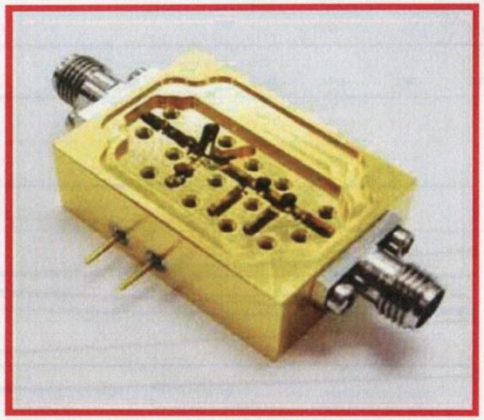
In the development of these receivers, and most major electronics systems, the designers must break the system down into modules, many of which they have seen before, perhaps many times. So when they want to test their new paper design, it's smart to bread-board it with interconnected ready-made modules, like these:

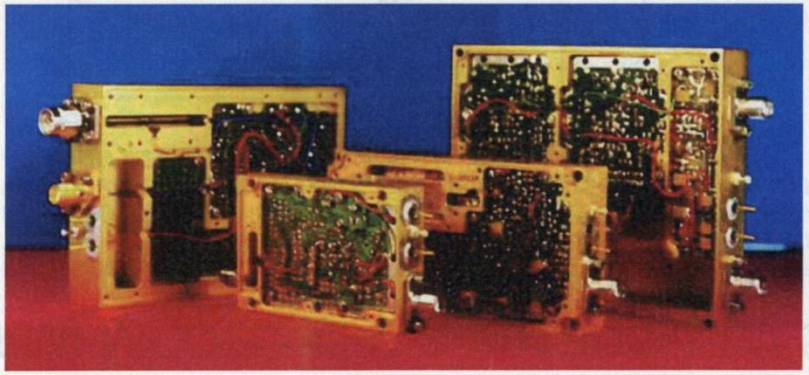


One of the major suppliers of such modules is PMI (Planar Monolithic Industries), Frederick, MD.

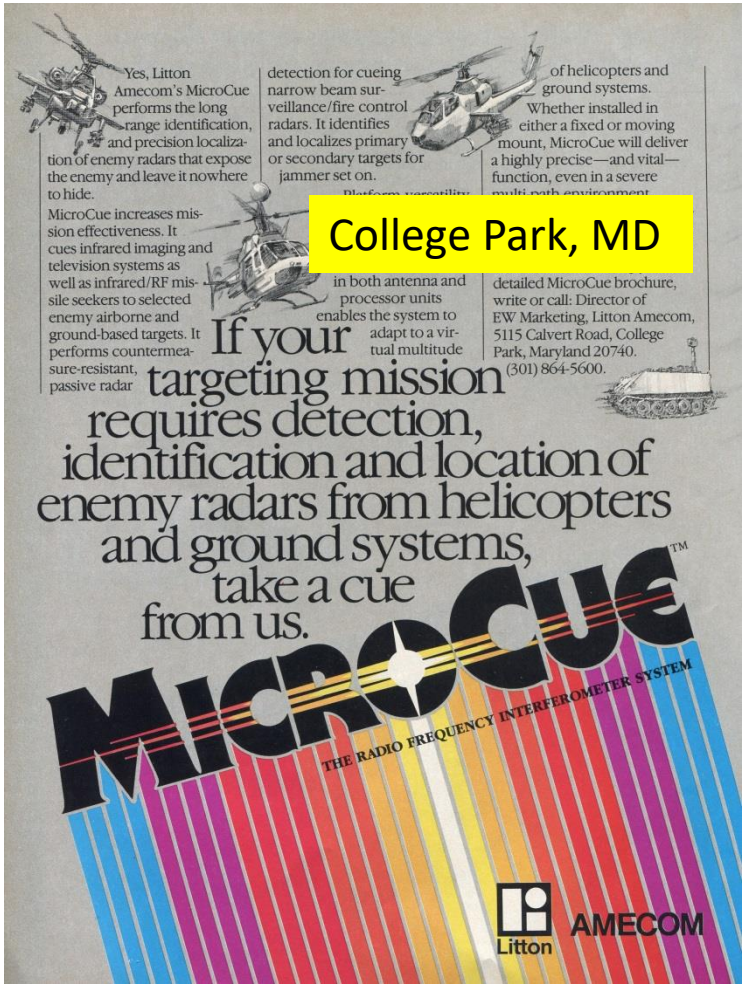
4 - DLVAs, ERDLVAs & SDLVAs



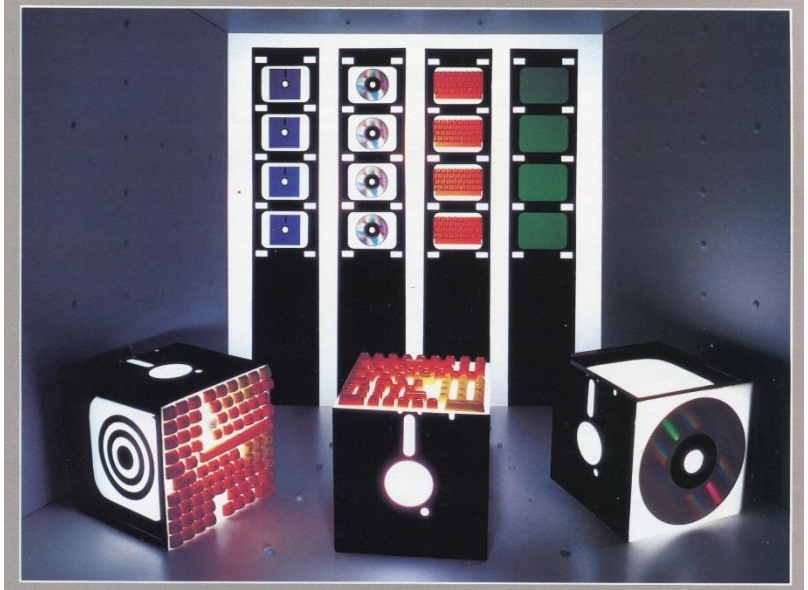




Here's a sampling of some ads from DELMARVA companies.



TOMORROW'S SYSTEMS



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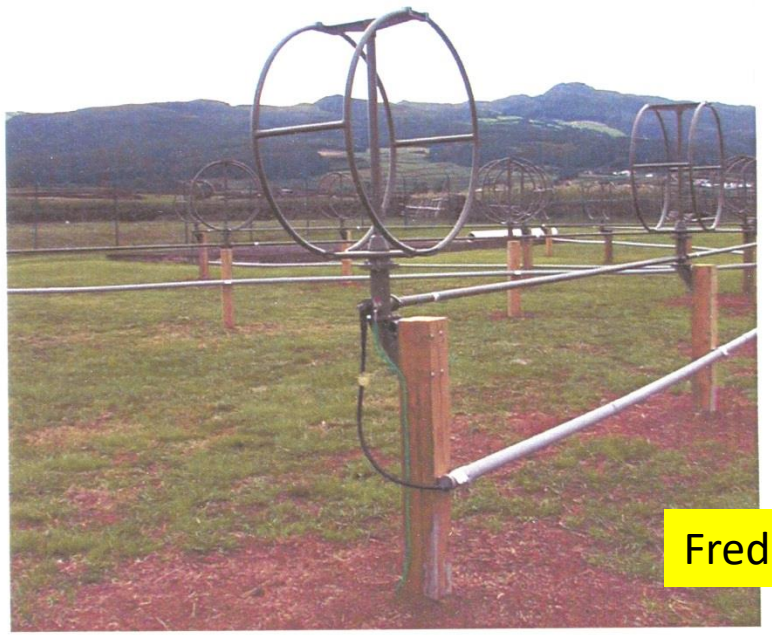

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UNITED STATES ANTENNA PRODUCTS, LLC.

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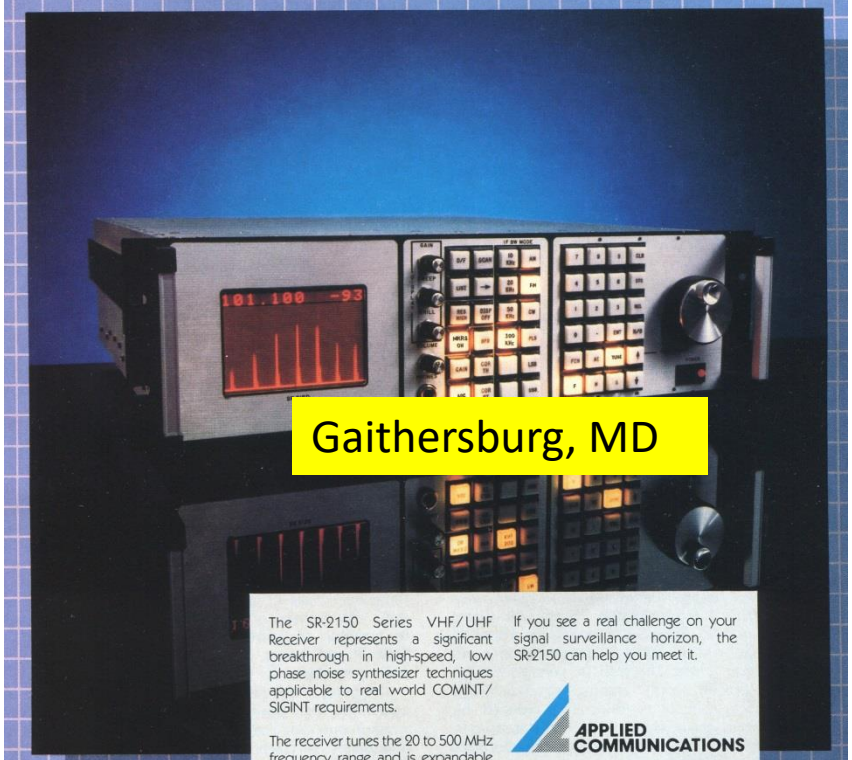

Gaithersburg, MD

SR-2150

The SR-2150 Series VHF/UHF Receiver represents a significant breakthrough in high-speed, low phase noise synthesizer techniques applicable to real world COMINT/SIGINT requirements.

The receiver tunes the 20 to 500 MHz frequency range and is expandable to 1200 MHz. Designed for signal intercept, search and DF applications, this receiver may be deployed for use in fixed station sites, mobile monitoring systems, airborne, shipboard and submarine collection systems. Thanks to its specifically designed modular flexibility, the SR-2150 Series Receiver is easily configured to form the nucleus of computer controlled and Master-Slave hand-off systems.

If you see a real challenge on your signal surveillance horizon, the SR-2150 can help you meet it.

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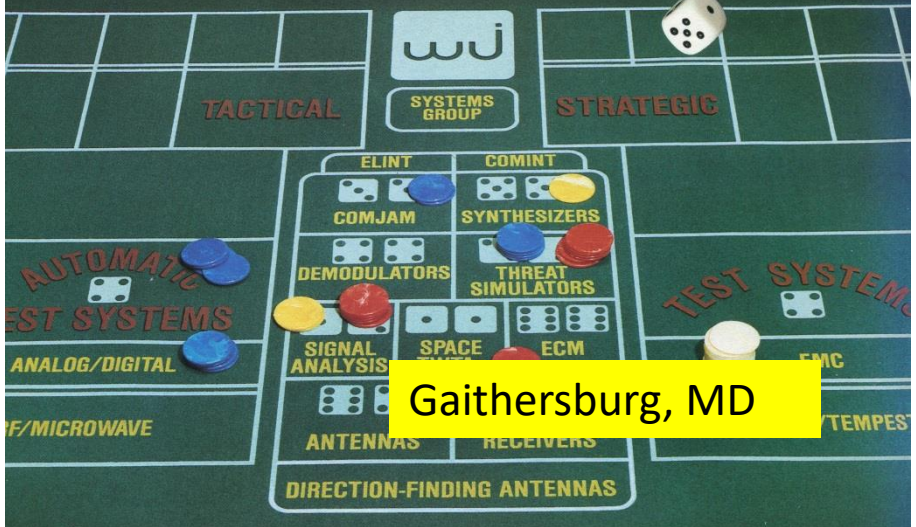

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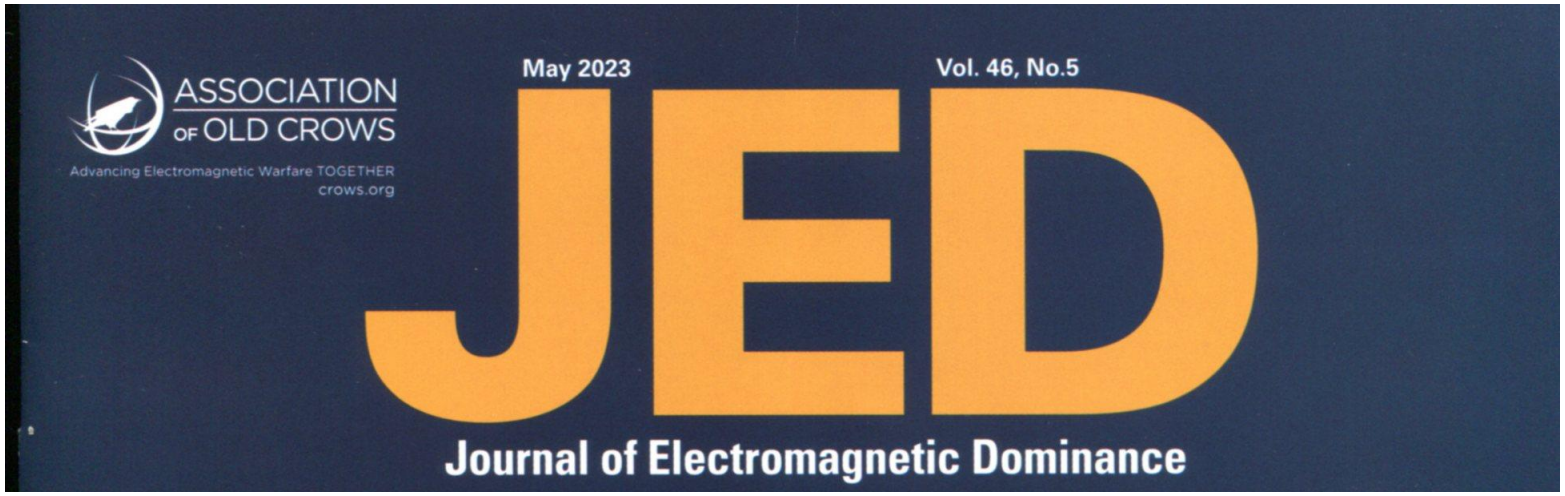
From WW2 until about 1985, many of these electronics producers were in Alexandria and Arlington, VA, including Atlantic Research, Melpar, Inc., Jansky-Bailey, and Riverside Research, but in more recent years the industry became more concentrated in Maryland, largely in Montgomery, Howard, Frederick, and Baltimore Counties.



In May 2023, the Association of Old Crows, a world-wide group of thousands of current and former scientists and workers in radio-electronics, surveyed the present crop of ELINT and COMINT radio receivers in use throughout the world.

Of the total of 50 different models of receiver/analyzers in use, worldwide, 20 were made in the USA, and of these, 8 were made in the DELMARVA, by 6 different companies.

And, to appease the collectors among you, here's a beautiful Bendix (Towson, MD) 526 Catalin radio of 1945-46 (Courtesy of Radio Attic)